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REPORTS

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FOCUS

The end of the cold war gave rise to the phrase 'peace dividend,' to which many hopes were attached. Sadly, the expected returns have not materialized. We have not seen massive funds freed up from military spending and diverted toward problems of the environment and development. Rather, the number of violent and destructive conflicts around the globe appears higher than ever. Funds are going toward peacekeeping, emergency relief and reconstruction instead of toward sustainable development programs.

If there had ever been any question that security, development, and environmental integrity are all cut from the same cloth, the ongoing conflicts in Angola, Rwanda, Somalia and elsewhere should have put such doubts to rest. We know that national and human security, a sound natural environment, and progress on development goals are all interdependent. We are learning that the many dimensions of conflicts — political, ethnic, socioeconomic — demand the expertise of a variety of disciplines, including international relations, development studies, and conflict studies. A concerted multidisciplinary focus may point to the most effective methods of identifying and preventing the tragedy of further conflict.

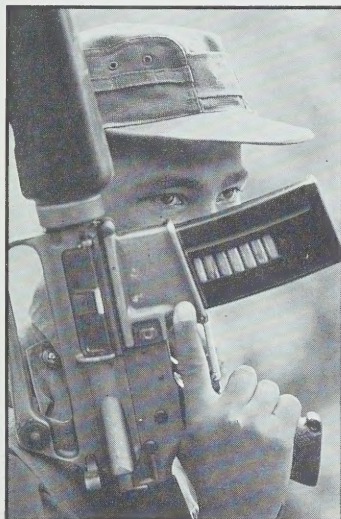
Editor-in-Chief

IDRC

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Global Conflict and the Path to Peace



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AN ENVIRONMENT FOR PEACE

Despite the end of the cold war, the global community continues to be confronted by devastating conflicts. Most of these conflicts do not erupt between warring countries but are internal hostilities in nations afflicted by such ills as the deterioration of the environment and poor governance.

The only real hope for many countries threatened by civil war, humanitarian tragedy or serious structural collapse lies in a comprehensive preventive approach that involves all international development and humanitarian organizations, regional organizations as well as national development agencies and NGOs. We cannot continue to apply short-term, unsustainable fixes.

In the west, the collapse of the Soviet Empire brought feelings of vindication mixed with strong hopes of a world more amenable to democracy and peace. But the forecasts of a new world order overestimated the strength of peace in many regions, made vulnerable by a variety of environmental and economic factors.

This vulnerability is evident in various challenges to peace and democracy that surface through inflation, riots, nationalism, and ethnic cleansing in Eastern Europe or through famine, factionalism, and large-scale civil wars in the Third World. More often than not the common underlying basic factor is *insecurity* prompted by the perceived threat of poverty or the prospect of isolation and fragility through diminishing access to resources.

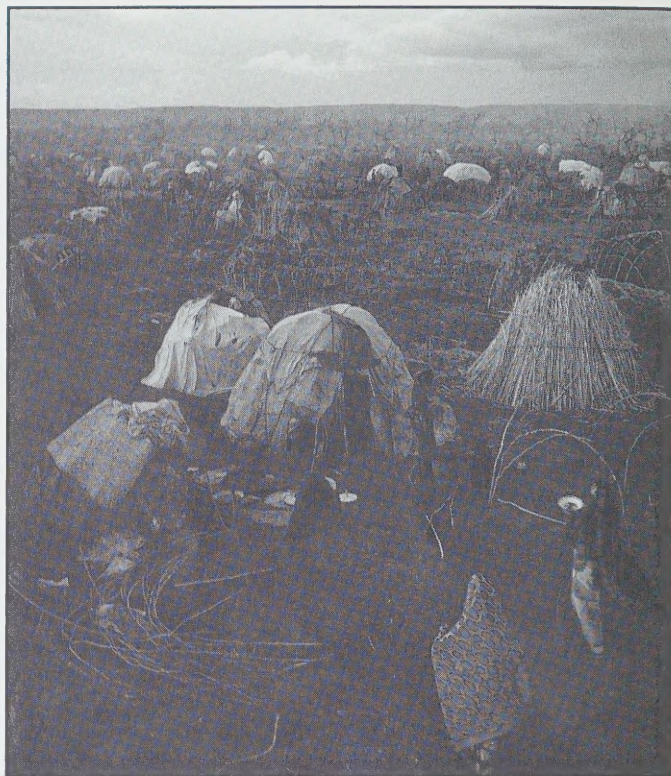
In Somalia, I was struck by the fact that nothing within Somali society contained obvious seeds of division. Somalis belong to the same ethnic group and share largely the same language and religion. Yet there has been a total cleavage of society along clan, subclan and sometimes even family lines. The instinct of survival, in a threatening political and economic environment, was the basic motivation in the behavioral pattern of the Somali people. This instinct becomes acute when repeated droughts worsen further a traditionally hostile environment.

The rationale behind the Somali case exists in many other conflicts in more or less elaborate forms. A serious analysis of the preliminary stages of these conflicts leads to this largely common paradigm of insecurity, further emphasized by deep recession, environmental degradation, and governance deficit.

ORIGINS OF CONFLICT

Conflicts have their own specific causes, identities, and characteristics. Some broad categories of the origins of potential and current conflicts are as follows:

- A failed process of integration in the creation of a nation-state (Chad, Somalia, most Sahel countries, Uganda during its eight years of civil war, and several crises in Central Asia). The absence of a national unifying factor, such as a social class or an enlightened leadership, slows down the process, producing dangerous setbacks. We should remember that it took several



Roger Lemoyne

Somali refugees in Ethiopia. Underlying many conflicts are insecurities heightened by environmental degradation, economic collapse and a governance deficit.

centuries and numerous civil wars for Europe to reach the nation-state phase and the end of empires.

- A colonial legacy or a difficult decolonization process, linked mostly with the drawing of borders by colonial powers (Togo and Ghana, Nigeria and Cameroon, India and Pakistan, Israel and Palestine, the independence of Armenia, Azerbaijan, Eritrea, and Georgia).
- Liberation movements or social revolts later infected by the cold war virus to become protracted conflicts (Afghanistan, Angola, Cambodia, El Salvador, Mozambique, Nicaragua, and Vietnam).
- Conflicts based in ethnic tensions (Burundi and Rwanda, Sri Lanka, Liberia, and the former Yugoslavia). Strong differences and traditional enmity between ethnic groups are compounded by historical factors and bad management. Power has been monopolized by a specific ethnic group, sometimes even a minority, that refuses to relinquish power for various reasons, including fear of revenge.
- Conflicts of a religious character (Bosnia, Cyprus, India, Lebanon, Northern Ireland, Philippines, and Sudan).
- Conflicts based in socio-economic or political tensions (Peru, Central America, Suriname, the Congo, and the rise of fundamentalism in the Middle East and North Africa).

- The classic war of aggression prompted by the “*esprit de grandeur*” (the Iraqi invasion of Kuwait and the Iraq-Iran war). Although more rare today, the UN Charter emphasized these conflicts — based on the experience of two world wars.

These categories can overlap, but by clarifying the different identities of crises, we may concentrate efforts for preventive action and conflict resolution. We may also isolate aggravating factors such as arms export, foreign interference, ambitious leaders, damaged administrative and other infrastructures, weakened traditional processes of conciliation, and an often inadequate response to a humanitarian tragedy.

THE RWANDAN CASE

Rwanda, whose tragedy is witnessed by a largely paralyzed international community, is a typical case of a crisis with various, convergent causes. These causes include large arms supplies to both the government and the opposition, a government unable to respond to its peoples' basic needs, and a colonial legacy partly responsible for exacerbating ethnic antagonism. One should add, however, that the worsening economic situation has been compounded by a substantial increase of the population and severe droughts.

Most of these conflicts are not necessarily endemic. However, separate ingredients of crisis can gather like stormclouds, given the opportunity. And the continuing deterioration of the resource base in many developing countries undermines the possibilities for resolving conflicts. Environmental degradation and deterioration of the socioeconomic situation force people to move, impinging on the limited resources of host populations both at home or in countries of asylum. Violent conflicts that ensue put serious strains on natural ecosystems and further threaten life-supporting properties. Not surprisingly, these conflicts occur mostly in Africa, Asia, and Latin America. UN statistics indicate that as a percentage of the GDP of developed countries, Africa's GDP per capita fell by about 50% between 1960 and 1990, a decline that is largely true for Latin America as well.

The circumstances that can provoke conflict also relate to what I call the *governance deficit*. Governments that are unable to plan for food security and implement emergency measures to cope with natural catastrophes are often themselves a large factor in the conflict. The power elite seeks to protect its economic and political interests, even at the cost of deepening ethnic, religious, or social tensions.

It is a vicious circle that we need to break. The international community should locate all existing and potential crises, examine both the immediate and remote causes, and draw lessons about the role of aggravating factors and the environment in igniting conflicts. But the required leadership has not yet come forward. The UN has, so far, responded to crises in a routine fashion, sometimes with dangerous improvisations. A golden opportunity for action was missed at the UN Conference on Environment and Development at Rio de Janeiro in 1992. UNCED

underlined the necessary interdependence of global ecosystems and, therefore, the vital importance of international cooperation. But in terms of both institutional measures and funding, UNCED fell short of expectations.

INTERVENTION: GREY AREAS

The massive interventions in Cambodia, Iraq, Somalia, and now Bosnia have produced problematic grey areas between peacekeeping and peace enforcement that can have tragic consequences and create terrible predicaments for field officers. The UN management was ill prepared for such vast operations, yet it helped push through a new peacekeeping agenda.

There is little doubt that armed intervention is justified in special circumstances. In the case of blatant aggression, for instance, the international community is entitled by Chapter VII of the UN charter to act. Nonetheless, suspicions can persist that powerful members of the Security Council may apply double standards. Therefore, solid criteria for action by the Security Council need to be established and the broad membership of the General Assembly must somehow participate in decision making. With a view to providing safeguards, some of the middle powers should assume moral responsibility for monitoring decisions to intervene and their implementation.

There is also international consensus that the traditional peacekeeping operations initiated by Canada's Lester B. Pearson should continue. Peacekeeping should continue to focus on conflict containment with the consent of the parties concerned. These operations have new dimensions with the task given to the UN of monitoring a comprehensive settlement between all parties to a conflict. The record here has been mixed, with success in Namibia and perhaps in El Salvador, but mostly failure in Angola, to cite but three examples.

The most recent manifestation of UN armed intervention is what many call humanitarian intervention. It was undertaken partly in Iraq, although Somalia and Bosnia are the most striking examples. In such cases, the goal is to protect emergency relief supplies and the people involved in humanitarian assistance. These operations raise serious questions about the circumstances in which they have been initiated, their management, the logistics, and the political strategy.

The operation in Somalia alone will have cost around \$2 billion to protect less than \$50 million worth of effective emergency relief. As of late 1993, an estimated 6,000 Somalis and 83 UN peacekeepers may have died in clashes between UN forces and Somali armed groups since the UN took over from the American-led Operation Restore Hope in April 1993. This tragedy deserves full investigation.

Although armed intervention in a humanitarian tragedy should never be ruled out, caution demands that we exhaust all possibilities short of military force. All aggravating factors must be dealt with firmly. Interference from outside, such as Serbia's role in the Croatian and Bosnian conflicts or supplying arms to parties in conflict (e.g. Somalia), *must be stopped first*, in the same way that



Croatia. Middle powers such as Canada and the Nordic states could take the diplomatic lead in preventing conflicts.

external aggression would be treated. The UN and regional organizations must develop guidelines specifying when and how they would become engaged and what action to take separately or in concert, choosing among political, diplomatic, economic, humanitarian and military options.

At present, UN capabilities fall tragically short of needs. In 1981, Secretary General de Cuellar set up an office for research and information with primary responsibility for early warning. His successor decided in early 1992 to abolish it. A proposal to set up observation posts in explosive areas of the world was never implemented. Yet the international community needs these new structures.

PREVENTIVE MEASURES

Since the world is gradually moving toward multiple centres of power, middle powers such as Canada, the Nordic states and others could provide the necessary moral leadership. It requires a comprehensive strategy focusing on researching, developing, and applying preventive measures for specific potential crises. In a sense it would mean initiating a type of smaller-scale Marshall Plan in different regions. I call them Marshall Plans because they will have to develop and rely largely on the local, national, and regional indigenous capacity.

What is needed from outside is a boost to contribute to a positive environment, recognizing that the fundamental changes have to be made from within nations, especially in governance. We have to target those countries that are strongly affected and whose recovery can be an example for others to follow. Canada has, in IDRC, a remarkable instrument that by fostering research in developing

countries would be able to open many possibilities to address efficiently some of these preventive measures.

I was truly encouraged by the recent report *Canada and Common Security in the Twenty-First Century* from the Canada 21 Council, a group of Canadian scholars and public servants. In concluding, I would like to quote from this report.

"In a world where frontiers are ever more transparent, we are subject not only to a dynamic global economy and a fragile planetary environment, but also to the consequences of the disparity between North and South in human, social, financial, and technological capital. Lack of attention to these disparities can only lead to broad threats to common security that will challenge our way of life. The Canada 21 Council believes that preventive action is essential. Action now can help to sustain communities and avoid conflict that could require far more expensive peacekeeping and peace enforcement activities later. When given a choice, people in the South, as in the North, prefer to live and work in their own communities. Poverty, unemployment and underemployment, environmental deterioration, homelessness, and mass migration are problems best dealt with at their source."

Mohamed M. Sahnoun is the Pearson Scholar at IDRC and former Special Representative of the UN Secretary General in Somalia.

PREVENTIVE ALTERNATIVES TO CONFLICT

The international community should place less emphasis on UN peacekeeping and more on development strategies that promote good governance, in response to the spread of armed conflicts around the world, said speakers at an April IDRC symposium on peacekeeping, peacemaking and aid.

Against most expectations, conflict between and within states has increased rather than decreased since the Cold War ended. In 1992 and 1993, 160 conflicts involving either violence or the threat of violence dotted the globe, including 33 in the states of the former Soviet Union. "Conflicts today are more often between peoples than over ideologies and it's more likely that future conflicts will centre on entitlements and on provisions than over political hegemony — water in the Middle East being one example," said Keith Bezanson, president of IDRC.

According to Major General Lewis MacKenzie, who retired from the Canadian army in 1992 after serving as Chief of Staff to the United Nations Protection Force in Yugoslavia, more peacekeeping missions were launched in the past five years

than in the last 40 years. Meanwhile, peacekeepers have been forced into new roles, such as assisting aid workers, often without adequate resources.

"In most cases, it wasn't premeditated," he said. "The UN's involvement in humanitarian activities really hit the spotlight after we led the Kurds down the garden path after the Gulf War. The UN, in its wisdom, passed a tough resolution that authorized the use of force to provide some element of protection and also to feed them."

DANGEROUS PRECEDENT

The operation succeeded, but set a difficult and dangerous precedent. In Bosnia and Somalia, the "uneasy marriage" between peacekeepers and aid workers has placed lives at risk. Moreover, the total bill for the peacekeeping missions has greatly exceeded the value of the aid they were designed to protect.

In the case of Bosnia, humanitarian assistance began on a small-scale and was initiated by four soldiers, including MacKenzie. He explained that in 1991, with Serbia and Croatia at war, a ceasefire was arranged that placed 14,000 UN peacekeeping troops into the occupied areas of Croatia, where the Serbs are in the majority, and a headquarters in Sarajevo.

"The UN provided no troops to support (headquarters). Within three weeks of our arrival, we were forced out of Sarajevo and into Belgrade after the international community left. We had no mandate and no resources, but we felt professionally embarrassed. So we decided to ask the Serbs for the airport in Sarajevo, to bring in food and medicine. It worked within minutes."

After MacKenzie left Sarajevo in August of 1992, the UN expanded its operations to include all of Bosnia. Since there were not enough troops to maintain a presence throughout the country, they ended up escorting humanitarian convoys.

"This, from my perspective, is a dumb idea because people don't interfere with humanitarian convoys with artillery and sniper fire, mortars and tanks. They interfere by sniping women and children in the street. One person stands in front of you and warns that if you drive one more foot down the road, his buddies over the next hill will cut 20 throats," said MacKenzie.

"You've then got three choices," he said. "You can leave with your tail between your legs. You can keep driving and let them cut. Or you can resist them, which means you're no longer a peacekeeper, you're now taking sides."



Nicaragua. The growing number and types of UN peacekeeping missions are forcing UN soldiers to take on new roles and sometimes to choose sides.

Ideally, peacekeepers should leave the job of distributing humanitarian aid to NGOs and limit their contact with them, said MacKenzie. In situations like Bosnia, "where it is dramatically apparent that there's no peace to keep, peacekeepers ultimately are going to be associated with one side or another. The moment that [NGOs] have a direct linkage with the peacekeepers, then they are tainted and are no longer impartial, and that is death."

"In 1991, there was no will to focus on creative political solutions as an alternative to conflict and no will for the international community to combine its resources for that end. The costs of preventive action then, of course, would have been negligible beside the horrendous costs that are still being paid on every conceivable scale."

He added that it is unrealistic to expect that most of the aid sent to war zones will get to the people who really need it. "If there is peace to keep, you can deliver humanitarian aid. But when there is no peace to keep, most of the aid goes to soldiers and their families, or ends up on the black market. If you get 50% through, you are doing really well," said MacKenzie.

STRATEGIES TO REDUCE CONFLICT

While the world looks to peacekeepers to resolve existing conflicts, more resources should be put into preventing conflict, said Bernard Wood, director of development cooperation at the Organisation for Economic Co-operation and Development (OECD) in France. What's needed, he said, are development strategies that aim to reduce the sources of conflict in societies or, at least, to equip them to manage those sources more effectively.

Wood said the root causes of conflict often lie in under-development, but are rarely simple. "Economic scarcity, even extreme poverty, do not necessarily generate conflict, although perceptions of great inequality may do so if they take hold in a society where such inequality is not culturally sanctioned."

It follows that the key to preventing armed conflict is to "successfully manage competing interests and loyalties" within and between societies. "This is where development strategies placing primacy on good governance and participation offer a realistic if not an easy hope for bringing the joint promise of peace and development closer together," he argued.

"Through better governance, political power is made less absolute power, and the struggle for political power less of a life-or-death struggle. By restricting the economic functions of state power to the vital tasks, the potentials for corrosive corruption and divisive favouritism are reduced. By achieving higher standards of respect for human rights and the rule of law, a sense of shared citizenship can grow in the place of violent abuse," said Wood.

According to Wood, some attempts were made to strengthen the government apparatus in Yugoslavia, just prior to its breakup. At an international seminar in Ottawa, in June 1991, "a number of interesting constitutional proposals were raised that would today be welcomed with open arms by most of the people in the warring republics and by the international community," he said.

"But at the time there was no will to focus on creative political solutions as an alternative to conflict and no will for the international community to combine its resources for that end. The costs of preventive action then, of course, would have been

negligible beside the horrendous costs that are still being paid on every conceivable scale."



Roger Lemoyne

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John Eberlee

THOUGHTS ON A NEW WORLD ORDER

Before discussing the substance of the world order we should like to see, we must first say a few words about how today's international system has come into being.

Generalities are not much use and hardly help us to plan for the future. Nevertheless, there are certain major trends in the international system, as noted by the American specialist Michael T. Klare in his book *Peace and World Security Studies*, from which we might borrow here.

- Violent conflicts of all kinds will continue to occur in the years and decades to come;
- No major powers or centres of power will be able to establish their hegemony over the whole world, let alone over large parts of it; on the contrary, we shall see a world that is highly fragmented with a few islands of relative stability (North America, Western Europe), which will be surrounded by vast areas subject to chronic instability and violence;
- Although the risk of global conflict or of war affecting a whole continent ... cannot be ruled out, the greater likelihood is that we shall witness a global proliferation of local disputes, insurgencies or ethnic and religious conflicts;
- Although it is possible that nuclear or chemical weapons, if not both, will be used in local conflicts and in these domestic wars, most wars in the future will be waged with conventional weapons;
- No single institution or entity alone will be responsible for making peace on a global scale and no single *strategy* for making peace will apply to all cases of conflict. The task of peacemaking will instead be shared by a wide range of bodies — the United Nations, certain states, regional organizations, non-government organizations (NGOs), concerned individuals — and, similarly, use will have to be made of a broad range of techniques for making

peace to deal with the range of likely conflicts.

This means then that the world of tomorrow will be highly fragmented as far as international security is concerned, despite the globalization of trade and the means of production that make our world appear increasingly homogeneous. Peacemaking will be all the more difficult since the UN and other organizations have not yet found the means to guarantee effective international peacekeeping and security, and the security that was until recently indivisible may well become increasingly divisible, as is clearly shown by the recent examples of the conflicts in Rwanda, Somalia and the former Yugoslavia. The conflicts of tomorrow will not necessarily be those which we can foresee or for which we have prepared ourselves.

This image of a world in which disorder is increasingly common, where the whole planet may well blow up or where it threatens to disintegrate piece by piece, is hardly encouraging for the freedom of

peoples and the democracies. The image of the world as a leopard skin, where areas of peace exist side by side with huge areas of insecurity is hardly more encouraging for the future of the democracies. Be that as it may, three main concepts seem gradually to be emerging.

The first is that security cannot be reduced merely to its military dimension. New threats are constantly appearing and other types of institution are necessary to deal with them. Second, the North-South problem has been an ever-present reality since 1945 and has gained fresh vigour since the end of the Cold War (which dates back to the fall of the Berlin Wall and German reunification). While the work of the Brandt and Palme Commissions showed that military spending contributes to the economic insecurity of states and that there will be no peace until we achieve social justice and a new international order, there is still many a slip between cup and lip. States have barely begun to put into practice the principles of environmental



Karen rebels, Myanmar. Many areas of the world will continue to be subjected to insurgency and conflict.

protection and better sharing of resources around the planet.

Third, as far as international organizations are concerned, the first efforts at changing the international security system began with the publication of the UN Secretary General's *Agenda for Peace*, but here too there is much still to be done. The remainder of this article will concentrate on this last point.

PREVENTIVE DIPLOMACY

Much of *Agenda for Peace* dealt with improving international institutions and their mechanisms for intervening to resolve conflicts. In addition, much stress was placed on the possibility of intervening before conflicts occur, in other words, the possibility of giving the UN a real capacity for preventive intervention. This capacity would be possible if the UN were equipped with a truly international army.

However, this concept suffers from three fundamental weaknesses. It does not in any way make the upstream decision easier, and this is tantamount to saying that the UN Security Council will always be responsible for deciding whether to intervene. It is easily forgotten that an international organization always reflects the wishes of the member states and that those most concerned act only when their interests are threatened. Secondly, recent examples tend to suggest that the greatest misfortunes occur when all vestiges of government within a country collapse entirely. Somalia and Rwanda provide good examples but Afghanistan and the Sudan could be added to the list. The new face of international relations has introduced a new element to preventive diplomacy: the peacekeeping dimension. In this area, it is the NGOs above all that can achieve something in cooperation with the UN, rather than the UN acting alone because it does not have a mandate or the capacity for civilian intervention. Better coordination between the UN and NGOs could in future facilitate matters in this area but this would not do much to increase the ability of international organizations to intervene. Finally,

no state has yet expressed its willingness to place its troops under UN control.

A SEMI-PERMANENT UN ARMY?

For all these reasons, there is increasing talk of establishing an army of "standby" forces in which certain states would agree to place at the disposal of the UN national contingents, which could intervene at the request of the authorities concerned. While progress has been made in this area since the UN Committee of 33 was created in the late sixties (it became the Committee of 34 when China decided to join), the fact remains that all the problems involved in setting up this international army still revolve around the issues of control and command, standardization of equipment, common procedures accepted by all the members on all types of missions as well as problems of logistics, education and training. Canada has done and continues to do a great deal in this regard.

In April 1994, as it had done in Kingston in 1967, it played host to fifty or so countries who came to this country to discuss these problems. In the meantime, on May 5 of this year, the Clinton Administration published a document on UN shortcomings in the field of peacekeeping. This document seems to give a death-blow to the notion of peacekeeping as such since the United States would intervene only if international peace and security were threatened and if its interests were at stake. Despite this general pessimism, the fact remains that we may still hope, as long as other countries such as the middle powers in the international system take up the task and agree on a minimum set of criteria for action.

This last point is especially important because, while peacekeeping is still a popular commodity in Canada, all observers agree that it will lose this popularity if a lot of Canadian lives are lost in operations of this kind, which are tending to become more numerous and more dangerous.

Canada should cooperate with its main allies and devote its efforts to developing internationally recog-

nized standards in order to create a genuine system of peacekeeping, peacemaking and peacebuilding. As long as this does not happen, Canada could well be talking to a brick wall or be viewed as an idealistic fireman who is still unaware of the magnitude of the disaster to be avoided or contained. Even if we assume that the states will one day reach agreement to set up an international army made up of national contingents, such an army could not be effective in peace enforcement operations, which would still have to be overseen by the UN Security Council alone. Such a force could intervene only in cases of low-level conflict or in those situations where a country is in such a state of disorder that to all intents and purposes it has no real government. In addition, the establishment of such a force would not resolve the question of when and where the force could intervene and, for all these reasons, it might be preferable to abandon the expression "preventive diplomacy" and speak of a capacity for positive action by the UN or the international community.

It is widely accepted that improvement of the UN's capacity in this regard would offer three advantages. The most obvious is that it would help to give meaning to the concept of collective responsibility. The Cold War gave too much importance to the UN Security Council. Second, such a force might have been able to prevent the massacres in Rwanda but that does not mean that this would have happened if such a force had existed. Nobody can predict or rewrite history. However, it is reasonable to assume that, if this force had existed, it (the international community and certainly not the UN Security Council) might have intervened on time. Thirdly, this would be the only way to ensure an interface between the Secretariat and the Security Council since, because the former lacks the resources, it has become a mere enforcer, doing what the main states in the international community tell it to do.



Destroying weapons in Nicaragua. The world is still some distance away from creating an international army based on national contingents.

POSITIVE ACTION AND DEMOCRACY

Recent examples of international peacekeeping and security sometimes serve as a warning to observers. Cambodia is held up as a UN success story and the conflict in the former Yugoslavia as a failure while the interpretation to be given to Somalia and Rwanda remains, to say the least, very dubious. There is confusion as to what should be done in Haiti, not to mention the war between the two Yemens or the situation in the Sudan.

Two factors seem important here. The first, which is amply illustrated by the situation in Somalia and Rwanda, is that peace and domestic order cannot be separated from the disastrous economic situation that prevails or has prevailed in those countries. Development and democracy do not always necessarily go together because Chile and many other examples in Asia show that harsh regimes are often the ones that are best at promoting the economic development of certain states. This having been said, the fact remains

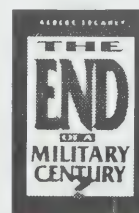
that democracy cannot be constructed on the ruins of bankruptcy and that it is of the utmost importance for the international community to examine this problem. The second problem is directly linked to the first: how do we build democracy? Here the examples of Russia and some of the former Soviet republics show that the change-over from totalitarianism to democracy does not take place overnight, just as economic growth is not something that can be arranged in 24 hours. We feel, therefore, that the linking of development assistance for the dual needs of learning and building democracy is a matter of urgency. In this area we need major coordination between Canadian NGOs and the main government agencies responsible for aid and international economic development, on the one hand, and between NGOs and the UN or any other regional economic organization, on the other.

As far as coordination with the UN is concerned, several areas of cooperation already exist such as the monitoring and control of elections in certain countries, the creation of

civilian police forces or the deployment of medical staff and specialists in transporting and shipping rescue teams or food to locations where conflicts or natural disasters occur. All these sectors should be further strengthened and better equipped as specialized national teams are created. Other examples could be examined such as the training required in the operation of democratic institutions or the strengthening of procedures relating to the rule of law, the creation of better guarantees to ensure respect for human rights and all the necessary know-how required for the free circulation of ideas and information.

These few suggestions obviously provide only an overview of the problems involved in building democracy but these few practical principles will perhaps be more effective in the long term if all those sectors that help to consolidate democracy work hand in hand rather than separately, which was the case in the past. Such a vision of the future clearly presupposes a major breaking down of bureaucratic barriers, especially a decompartmentalizing of the notion of peace and security, which would then be extended to include all areas of civil peace.

Albert Legault is Director General of the Centre québécois de relations internationales.



The End of a Military Century?
by Albert Legault. IDRC 1992,
120 pp., ISBN 0-88936-618-7,
CAS\$14.95.

LINKING DEVELOPMENT AND SECURITY RESEARCH

Conflicts within states have emerged dramatically as the global security threat of the post Cold War era: the challenge of understanding these conflicts has prompted a necessary cross-fertilization of development research in fields such as strategic affairs, international relations, and conflict studies.

This multidisciplinary is increasingly evident in recent activities supported by IDRC. For example, the Centre's four regional offices in Africa have all identified conflict as an underlying development problem in their respective regions. They are supporting initiatives that will shed greater light on the impact of conflict on African societies and identify strategies for dealing with the massive dislocations it causes. Similarly, the Social Policy Program has identified social reconstruction of war-torn societies as an area deserving closer investigation in the changing context of international, regional and national politics. Simultaneously, the Environment and Natural Resources Division is supporting several projects exploring relationships between conflict and environmental degradation.

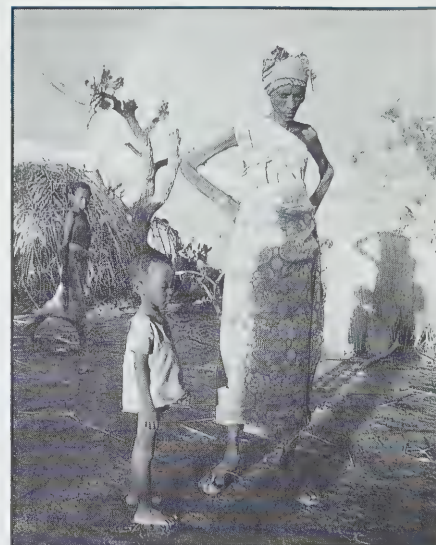
For some 50 years, most development thinking and practice has assumed that countries of the South could pursue their development within a world order maintained, albeit precariously, by the super-powers. A functional divide evolved between students of development, who focused primarily on the socio-economic or technical dimensions of development within states, and students of strategic affairs or international relations, who worked from a state-centred systemic perspective.

The breakdown of the old world order has stimulated an inevitable rethinking of the interplay between international peace, security and development. Poverty, food insecurity, competition over scarce resources, environmental degradation, transnational movements of populations, drugs and arms, and

ethnic conflict now pose serious questions to both research domains. What are the causes of nation-state disintegration in various regions? What implications do they hold for the international system? When do ethnic differences turn into armed conflict? How should external actors contribute to conflict prevention and resolution, peacekeeping and emergency assistance in intra-state conflicts? Can their interventions also promote developmental goals?

Over the years, IDRC has supported many projects relevant to the renewed interest in relationships between development, intra-state conflict and global security. A selective review of such projects since the late 1970s reveals the following areas of Centre interest:

- The resettlement of nomads in Somalia, exploring the transition from nomadic pastoralism to settled agriculture.



Somali refugees in Ethiopia. Wars such as that in Somalia have led researchers to regard conflict as a development problem in all regions of Africa.

PEACE, GOOD GOVERNANCE AND RECONSTRUCTION

A partial survey of current IDRC activities in support of peace, better governance and reconstruction touches most regions of the world.

Middle East Peace — IDRC supports initiatives to link the parties in conflict and improve people's lives. A fund shared with CIDA and Foreign Affairs provides analytical support to four Working Groups in the multilateral track of the peace process, which attempts to forge agreement on the more technical dimensions of arms control, regional economic development, water, environment and refugees. IDRC manages the fund and coordinates technical contributions from its own staff.

South Africa — Assisting in the transition to majority rule, IDRC sponsors research and policy making in the areas of: democratic governance, economic restructuring, the environment, gender equality, science and technology, land reform and rural development, and — in collaboration with CIDA — in education, and capacity-building for the civil service.

South Asia — Historical animosities and religious and socio-political differences have blocked regional cooperation among Southern and Central Asian countries. A regional arms race, involving not only conventional weapons but nuclear arms as well, imposes severe costs for poor societies and obstacles to economic growth and social justice. The project will present new options for regional security to policy makers and politicians.

Indochina — Since 1990, IDRC has been helping Vietnam shift from a centrally planned economy to a market-oriented system. The focus is agricultural and resource management, economic and scientific policy, information system support, and legal reform. The Centre is also strengthening research and policy institutions in Cambodia and Laos, and supports the Mekong Development Research Network, which encourages cooperation among the six Mekong riverine countries: Cambodia, China, Laos, Myanmar, Thailand and Vietnam.

Nicaragua — Although civil war has ended, the return of thousands of refugees, displaced people, and demobilized soldiers imposes heavy environmental impacts on lands, forests and water bodies. This project examines the socio-economic and environmental status of Matagalpa and Jinotega Departments. The researchers will disseminate sustainable development alternatives to the population, other researchers and policymakers.

- Methodologies for famine prediction in the Sudan, including closer examination of market and household behaviour alongside other socioeconomic indicators.
- The capacity of countries such as Botswana, Lesotho, Somalia, Swaziland, Tanzania, and Zambia to respond to the refugee crises of the mid-1980s as well as to control effects on their own populations.
- The needs of Indochinese refugees in Thailand.
- Health and nutritional requirements of refugees.
- The dislocations generated by famine and drought in Africa and the resultant population resettlement programs.
- Forced internal migration in Lebanon owing to protracted civil war.
- The interplay in Sri Lanka between resource allocation, education and ethnicity.
- The role of the media in ethnic conflict resolution in Sri Lanka.

The studies noted above demonstrate the importance of development research in examining systematically the complex links between international security and development. Recognizing this need, a recent IDRC grant to the United Nations Research Institute in Social Development aims at developing a framework for identifying key policy questions for countries emerging from protracted conflicts and for examining the role of domestic and international actors in rebuilding war-torn societies. The resultant framework will be tested through a series of country case studies and will then be developed further as a policy and planning tool at the local, national and international levels.

Necla Tschirgi, Senior Program Officer, Social Policy Program.

RWANDA

Restoring Agricultural Biodiversity

The conflict in Rwanda has left in its wake a critical agricultural and food security situation. The need for large-scale reproduction and distribution of seeds and planting material is urgent. Most crops have been eaten by birds and animals or harvested by the military. Some 50% of the population has been displaced. There are fears that people will eat what little has been left in the fields, including the seeds meant for planting next year.

Agricultural biodiversity is among the most important economic resources in Rwanda, one of

Africa's most densely populated countries, where the large majority live in rural areas. Rwanda has many different agro-ecological zones in which generations of farmers have adapted a wide range of varieties to local conditions. Both this agricultural biodiversity and the knowledge of farmers (women and men) related to crop production and reproduction have important economic, social and cultural values.

"Seeds of Hope" is a joint initiative of six International Agricultural Research Centres (IARCs) in collaboration with research and relief organizations in countries neighbouring Rwanda. The main goal is to reintroduce seeds and planting material for the most important crop varieties and landraces cultivated in Rwanda. These include beans, sweet potatoes, potatoes, maize, sorghum and cassava. Rebuilding agriculture and social and economic structures is vitally important not only for Rwanda, but also for the neighbouring countries of Burundi, Kenya, Tanzania, Uganda and Zaire, which are trying to cope with the massive influx of Rwandan refugees into their territories. The project also aims to contribute to rebuilding Rwanda's technical and research capacity.

Seeds are being reproduced already in neighbouring countries, and by the International Center for Tropical Agriculture (CIAT) in Colombia.

In co-funding this initiative, IDRC is supporting its network of research partners and their utilization of knowledge generated from previous research in the region. The Centre contribution is directed to socio-economic studies and surveys to assess the current situation, and to monitor and evaluate the restoration of biodiversity after the reintroduction of materials.

Luis Navarro, Regional Program Officer (Nairobi) and Ronnie Vernooij, Program Officer, Environment and Natural Resources (Ottawa).



IDRC: Eileen Conway

A Rwandan farmer before the outbreak of violence. Agriculture is a vital resource in Rwanda that requires urgent rebuilding.

TRUE MEASURES OF HUMAN SECURITY

Throughout today's world, traditional measures for protecting national security are failing to prevent tragic violations of the most basic aspects of human security. Territorial sovereignty and military capacity become scarcely relevant when human security concerns such as ethnicity, religion, the environment, governance, the economy and human rights turn into flashpoints for violent conflict.

The failure of models based on the national security perspective points to the urgent need for a new model based squarely on human security. Such a model would permit the UN and national governments to act quickly on early warning signals. Rather than permit the levels of atrocities we have witnessed in places such as Bosnia and Rwanda, a human security framework could alert appropriate actors to uproot the seeds of conflict well before they take hold.

A preoccupation with state-centred security has long been at the heart of foreign policies both in developed and developing countries, and, consequently, has had high priority in policy formulation. It devours great quantities of scarce financial and human resources through spending on armed forces personnel, military hardware and weapons systems. Such misallocations affect the capacity of developing countries to invest resources in addressing human security problems. Paradoxically, then, excessive spending on conventional security measures can indirectly worsen the human security situation, thereby contributing to potential conflicts.

Recent efforts by the world donor community to move to some degree from a state-centred perspective to focus more on indicators of human development is a step toward enhancing the importance of human security. Publications such as the *Human Development Report* of the United Nations Development Pro-



Cheryl Albuquerque.

The roots of conflict can often be traced to problems of poverty, inequity and social oppression. (Kenya)

gram reflect a desire in the international arena to reconsider the traditional indicators of security needs. As demonstrated in Central America, Eastern Europe, and Somalia the roots of potential conflict can too often be traced back to problems of poverty, inequity and social oppression of one kind or another.

HUMAN-CENTRED DEVELOPMENT AND SECURITY

One could argue that the notion of human security has always been implicit in the concept of development. However, the failure to achieve longstanding development goals along with increases in societal conflict in various forms demonstrate that the complex interplay of developmental and security factors has not been fully understood.

What precisely does human security mean? One answer is found in an examination of IDRC-supported research related to societal interdependence and the mutual vulnerability of the North and the South. It concluded that human security implies, as a minimum, a number of interwoven dimensions centred on human dignity¹:

- personal and physical security: the right of individuals and communities to preserve their own life and health and to dwell in a safe and sustainable environment.
- economic security: access to employment and to the resources necessary to maintain one's existence, with adequate measures taken to reduce maldistribution and artificial scarcity and to permit improvements in the material quality of community life.
- social security: providing protection from discrimination based on age, gender, ethnicity or social status, combined with access to "safety nets," knowledge and information as well as freedom to associate.
- political security: guaranteeing the right to representation, autonomy (freedom), participation and dissent, combined with empowerment to make choices and a reasonable probability of effecting change. This political dimension includes legal-judicial security: individual and collective access to justice and protection from abuse.
- ethnic and cultural security: a social climate in which minority populations feel secure in expressing their cultural identity.

RISK ANALYSIS

A focus on human security requires preventive measures to anticipate conflict and, in the event of conflict, limit its escalation. To this end, a framework for risk analysis should be incorporated into the design of development policies and projects.

In the state-centred approach, the value of risk analysis lies in the ability to fully understand the context in which conflict might arise, and the factors that will perpetuate conflict. A similar grid could be applied to analyze security risks from a human-centred perspective. Thus the context in which conflict may arise, and the factors that sustain it, will relate to threats to human dignity such as a lack of food, water, shelter, education, autonomy, or protection from abuse. The ultimate goal would not be the use of force to deter such threats. But understanding them could point to policies and programs capable of preventing social deterioration and the escalation of conflict. Force then becomes a last resort when all other preventive efforts have failed.

A critical issue in a human-security centred approach lies in the ability to read accurately the indicators of a deteriorating social fabric. Clearly, such an ability is vital to uncovering warning signs that might not be visible at first glance. As Prof. Jorge Nef

of the University of Guelph states: "The key issue of real economic development is not the size of the GNP or the GDP per capita, nor the rate of growth of such indicators, but the essential growth of impoverishment in real terms."² Consider the following examples of such impoverishment:

- one-half to two-thirds of Africans live in a state of permanent and deep poverty.
- During the 1980s, the average per capita income fell by about three percent per year in Sub-Saharan Africa and by about 1.3 percent in the highly indebted countries of Latin America. The cumulative figures of economic decline for the 1980s indicate 25 percent for Africans and 10 percent for Latin Americans.

A better ability to read and interpret such socioeconomic indicators will significantly improve the possibility of anticipating and managing conflict before it escalates beyond control.

In the end, it is a sense of urgency and readiness for action by those actors required to intervene in situations of conflict that determines the success of any form of security analysis. A sense of urgency must also be cultivated as an essential component of the human-centred approach. This readiness for action could help reach the goal of developing preventive measures for con-

flict resolution, as advocated by UN Secretary General Boutros Boutros Ghali in his *Agenda for Peace*.

The moral imperative used to justify a nation's decision to resort to force is the preservation of state stability — in other words maintaining the rule of law. In the case of human security, the moral imperative for action is the preservation of human dignity in all its dimensions. If these dimensions of human security took greater priority in the risk analyses of national and international actors, it could at the same time go some way toward meeting crucial objectives of both sustainable development and global security.

Paz Buttedahl is at the Centre for National Security Studies in Kingston, Canada, on secondment from IDRC's Social Sciences Division.

Notes

1. Head, I.L. 1991. *On a binge of history: The mutual vulnerability of South and North*. University of Toronto Press, Toronto. 244 pp.
2. Nef, J. 1993. Address to National Defence College, Kingston, March.



Tribal community in India. The freedom to express cultural identity is one important measure of human security.



On a Hinge of History: The Mutual Vulnerability of South and North, by Ivan L. Head. University of Toronto Press 1991, 244 pp. ISBN 0-8020-2766-0

ACTIVE LISTENING FOR AFRICAN FARMERS

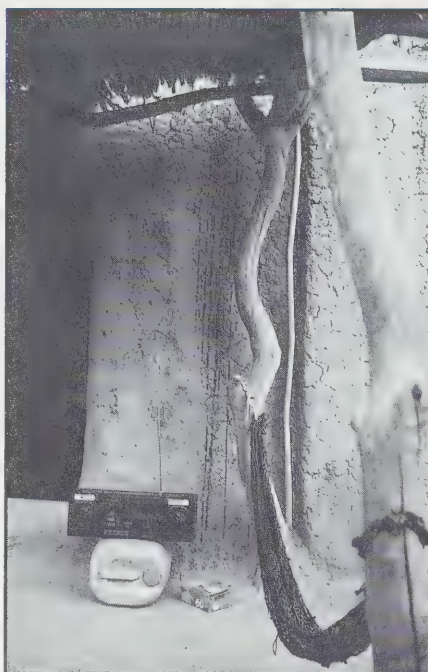
In East and Southern Africa, rural farmers are often far removed from services that can answer their information needs. Fortunately, the Farm Radio Network (FRN) brings up-to-date and practical information about agriculture and health as close as the nearest radio set.

The FRN is the Zimbabwe-based partner of the Developing Countries Farm Radio Network (DCFRN), a non-governmental organization located in Toronto, Canada. Established in 1979, DCFRN operates as an information exchange network in 110 developing countries. It relies not only on radio broadcasters, but on a variety of "rural communicators" to disseminate the latest research results on health, nutrition and agriculture. The material is prepared in the form of radio scripts, which are found easy to work with by health workers, agriculture extension officers, journalists and teachers alike.

Two years ago, DCFRN's executive director, Elizabeth Wilson, secured IDRC's support for a project intended to decentralize the network. In Wilson's view, real development would come when the organization's Southern counterparts had set up self-sustaining information networks. She foresaw DCFRN's African partner extending and improving the regional membership base, while DCFRN continued to provide institutional support and professional training.

'LOCALIZING' SCRIPTS

The office in Harare, Zimbabwe, the first of DCFRN's partnerships, addresses several important objectives. More effective participants can be identified in the region and better responses can be made to their information requests. Decentralization allows for translations into local languages, thereby increasing the number of language groups served. Finally, it permits local experts, such as Livai Matarirano, Program Manager for the African office, to



IDRC: Stephanie Colvey

Radio is a vital tool throughout Africa, bringing useful information to farmers.

produce scripts better suited to the needs of local farmers.

"The advantages of localization are that you can do seasonal things," says Matarirano. "When developing scripts here, you know where it is raining, what's happening. For instance, in Zimbabwe and Zambia we have recently had rat and mice problems. We know that people are listening for alternative solutions."

In East and Southern Africa, FRN scripts are distributed to almost 200 rural communicators working in 11 countries (Ethiopia, Kenya, Lesotho, Malawi, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia, Zimbabwe). The scripts are translated from English into local languages and broadcast on local radio programs. Some rural communicators turn the scripts into poems, posters, videos, films, plays, puppet shows or simply use them as handouts in their extension classes. The multiplier effect means that millions of people are reached about matters that directly affect their lives.

What is the content of these scripts? According to Matarirano, the

Network collects practical information on "everything that affects the farming family." For example, a recent FRN package distributed from Zimbabwe contained scripts with titles such as "Protect stored beans from weevils," based on information from a Guatemalan NGO; "Traditional, hybrid and improved crops," developed by an American farmer with community development experience in South Africa; and "Keep your cattle in good condition with poultry manure," written by Matarirano himself.

"It is the Network's contention that better than average technology has been developed by village-level farmers somewhere in the developing world and this technology is applicable elsewhere if similar conditions exist," says Matarirano.

"This kind of information can be gathered and distributed to communicators who can disseminate it for the benefit of small-scale farmers."

ESSENTIAL FEEDBACK

Rural communicators who apply to participate in FRN are accepted based on how they plan to interact with the small farmer and on how many people they can reach. A critical aspect of their involvement comes after the scripts are distributed, in the "feedback" phase. Participants must complete a simple questionnaire, commenting on the scripts received, indicating how they used them, and suggesting topics for future packages. Those who do not return the questionnaire no longer receive the script packages, which are sent out free, four times a year.

Matarirano says the feedback tells him that the participants greatly appreciate the script packages because of their clarity and simplicity of style. More importantly, "the information provided fills a vacuum," he adds.

The son of a farmer himself, Matarirano is well versed with their need for information. He also saw the need before joining FRN in his work as a training officer with the Zimbabwe Ministry of Agriculture's extension service, Agritex.

And Matarirano is keenly aware of the popularity of radio as a medium for agricultural information. Recent statistics claim that in Africa there is one radio for every 20 people, compared to one newspaper for every 200 people. Despite problems with batteries and the quality of transmissions, there is no doubt that many people are being reached through the network's radio broadcasts and its rural communicators.

Those same communicators send suggestions for scripts by the dozen to both the Harare and Toronto offices. Other ideas and information for scripts come from a variety of sources, including universities, colleges, and training and research institutions in the region. Libraries, journals and manuals are also scoured for new agricultural developments.

ACCURACY IS PARAMOUNT

Whatever the source, every script idea must be rigorously verified for accuracy. According to Elizabeth Wilson, who recently visited the FRN office, this task is extremely important. "For instance, if you're mixing something for a pesticide spray, and you don't check, you could kill your plants!" Checking is done by experts in Canada and again when the scripts are sent to Zimbabwe, where the FRN's advisory committee meets to thoroughly review the scripts,

WOMEN AND THE FRN: A VALUED AUDIENCE

Recognizing the importance of women in agriculture, the FRN makes extra efforts to have women participants. Many of the health, safety and nutrition scripts are written with women in mind. Women in Zimbabwe regularly use FRN's scripts through Listeners' Clubs, served by the Zimbabwe Broadcasting Corporation (ZBC). Through funding from a German organization, some 50 clubs were formed throughout rural Zimbabwe, and each provided with a radio cassette player. Broadcasts of 30 minutes are made weekly in Shona and Ndebele. Mr. Eddington Mhonda, a member of FRN's advisory committee, does the Shona broadcast every Monday. Mhonda then drives to the 29 clubs in his area to respond to questions generated by the broadcast. According to Mhonda, the groups are 80% women, and all except one have a woman monitor.

Mhonda recently took Elizabeth Wilson and Livai Matiranaro to one such Listeners' Club in Mutoko district. They discovered that the women actually met in the morning to prepare for the afternoon broadcast and to work on projects based on information from the broadcasts. The projects include crushing sunflower seeds for valuable cooking oil, fencebuilding and poultry raising.

At 2 p.m., the women religiously set the radio player under a tree, listened intently to Mhonda's broadcast, then went about taping their queries on cassettes provided to the groups, queries that form the basis for his next program.

"This is something special about the network: people can be in touch with each other," says Wilson. "An important factor that participants mention is fellowship — being part of something that's all over the world."

Mhonda added that there has been a discernible change in interests expressed by women since the Listeners' Clubs began in 1990. Whereas before they had wanted information on things like recipes, they were now requesting information on property rights, divorce, the loss of traditions, and how to beat the high cost of living.

"They see now that somebody is listening — they have found someone who can give an answer. They have lost their fear of authority," comments Mhonda. In many cases, the broadcasts are also an effective way for illiterate women to be informed without embarrassment over their lack of skills in reading and writing.



Members of the Changsachrere Radio Listening Club in Zimbabwe critique broadcasts and suggest new topics for scripts.



Livai Matarirano, Farm Radio Network Coordinator, is backed by an eight-member advisory committee.

revising as necessary, or dropping some entirely if they are considered inappropriate to the region. However, only two scripts have been put aside to date.

"I think we put our scripts together very well," says Wilson. "Every detail you could possibly know is in the script. If something needs stirring for 10 minutes, we say so — we don't just say 'stir'."

Presently, the core scripts are issued from DCFRN's Toronto office, based on proven suggestions from developing countries. In Zimbabwe, Matarirano is backed by an eight-member advisory committee with expertise in agriculture, nutrition, health, extension, women's affairs, appropriate technology and journalism. After selecting and editing relevant topics, about 12 scripts are sent out, and usually at least one of them is written locally. Questionnaires are also sent out, along with the African edition of the DCFRN newsletter *Voices*, written and compiled by Matarirano.

DCFRN's close connection with IDRC has proven beneficial for script development. For example, a recent question on how to grow bamboo, was answered through IDRC's bamboo and rattan network. DCFRN has also just received support from IDRC to write scripts based on *101 Technologies*, an IDRC publication describing successful appropriate technologies.

In Zimbabwe, the FRN operates out of the Wensleydale Farmer Training Centre in Macheke, a mixed farming district some 120 km from Harare. The centre's training director, Mr. Shadreck Tsimba, says that only a few people knew about DCFRN before it became decentralized. "Now a lot of people know about it. I've seen it grow; it's an achievement." Tsimba, who is also the Chairman of FRN's advisory committee, says future plans include targeting 10 communities, initially in Zimbabwe, to monitor their participation in the Network.

Matarirano also has ambitious plans for the regional network, including doubling the production of packages from four to eight per year, improving the communication skills of participants through more workshops on effective radio, print and face-to-face communications, and finding and translating more sources of information. Within the next three years, he would like to have active participants in positions as national coordinators, accountable for implementing the program in each country.

He also hopes to select a more appropriate name since the words "Farm Radio Network" do not embrace the many innovative forms of communication used to pass on the information from the scripts.

Elizabeth Smith in Harare

THE MAKINGS OF A GOOD FARM RADIO SCRIPT

The FRN chooses ideas that:

- aim at increasing food supplies and improving the quality of life of the small farmer and his/her family
- are practical and simple enough to be communicated clearly (on radio, in classroom, person-to-person)
- have been developed, tested and/or proven in the developing world
- are widely adaptable for use in areas of the developing world other than the area of its origin
- cost little or nothing, requiring only resources ordinarily available to the small scale farmer
- do not require any inputs that may be unavailable to the farmer, e.g. chemicals, drugs, inoculants, improved varieties, new plant species, animals, etc.
- require little or no technical help to implement.



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101 Technologies. From the South for the South, IDRC 1992,
231 pp., spiral, 5 x 11",
ISBN 0-88936-656-X, CA \$7.95.

BRAZILIAN DAYCARES: WEIGHING THE RISKS AND BENEFITS

Daycare centres are an ideal environment for the transmission of disease. Worse yet, they are the major channel for transmitting pneumonia, the main cause of child mortality in Brazil.

Thus we find that a young child will have five times greater chance of catching pneumonia in such an establishment than anywhere else, according to a study carried out in the state of Ceara in the Brazilian Northeast by Dr. Walter V.C. da Fonseca, a medical specialist in tropical diseases and epidemiology.

It is a fact that in developing countries, as much as in industrialized countries, the number of daycare centres is growing constantly. In Brazil, the number has more than doubled over the last few years. But this growth, which is still far from satisfying demand, is now faced with the thorny problem of communicable diseases.

Daycare centres that accept children under 6 years of age are mostly located in an urban setting. They take in, on average, between 125 and 200 children, mainly from low-income families who live on the city outskirts. Free daycare services are provided only to working mothers. This social phenomenon is explained by three factors: the greater number of single-parent families, more households supported solely by the mother, and finally the economic crisis that has hit poor families most severely.

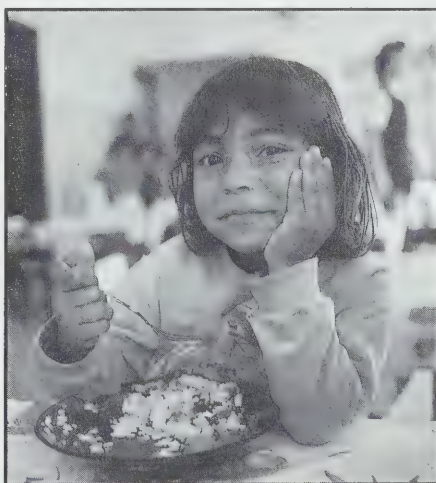
It is accepted today that the extra income earned in general by women is essential if the family is to meet its basic needs. This female workforce finds work among well-off families as domestic servants, as well as in the informal sector.

Brazilian working women thus have two options: leave their children to be cared for at home by a member of the family, or send them to a daycare centre, of which, as we know, the country has many kinds. Some of these are completely under the financial and administrative responsibility of the state, as in

Ceara, which is the only Brazilian state to subsidize a network of more than 200 such establishments and is often cited as an example by international organizations. In other parts of the country, there are public daycare centres that are totally financed by the municipality, and community centres that are only partly so financed. In the latter case, the city pays for construction costs, water and sewage services and electricity, the purchase of food and furnishings, but only a portion of staff salaries; the community must make up the difference through a modest financial contribution.

SOCIAL USE OF DAYCARE CENTRES

"Kindergartens" in Brazil offer more than just babysitting services, especially for children who come from a poor and illiterate background. The youngsters enjoy a place of privilege where, every day, they can eat all their meals, take two baths and get some rest. From the age of two, they are introduced to the letters of the alphabet, to numbers, to colours, to shapes and to board games, and later to reading and mathematics. Some centres even offer child psychology services to boys and girls who have learning difficulties or who suffer from a mild degree of mental retardation. The



IDRC: Denis Marchand

The educational and recreational services children enjoy in Brazilian daycares must be weighed against the risk of disease.

majority of these daycare centres offer a sound basic education and are considered in many respects as pre-school teaching establishments or nursery schools. These nurseries often have doctors, dentists and nurses to assess the state of health of the children. Finally, some daycare centres even find room to accept abandoned children, who are cared for and nourished until a family is found who will adopt them.

"Daycare centres represent a bulwark against the crime, child morbidity and illiteracy that poverty brings with it," says Dr. da Fonseca. "They give children a chance to learn despite the deprivation of their home environment. They are surrounded by competent and qualified personnel. Such institutions are valuable, in fact essential to the country's social development. They represent a form of progress that must be preserved if we are not to mortgage the future of our children and of our country." For this doctor, all these factors are reason to pursue research into a problem that has never yet been studied in Brazil or in Latin America.

We have long known that children run a greater risk of catching a cold, diarrhoea or pneumonia in daycare centres, but we were not aware that these centres constituted the number one risk factor for respiratory illnesses, and that until quite recently they were the principal cause of diarrhoea and child mortality. Research that was undertaken in 1989 showed an association between certain diseases and daycare centres, but it gave no specific information on these establishments. This gap will soon be filled, thanks to two projects being launched simultaneously in two regions of Brazil.

COMPARATIVE STUDIES

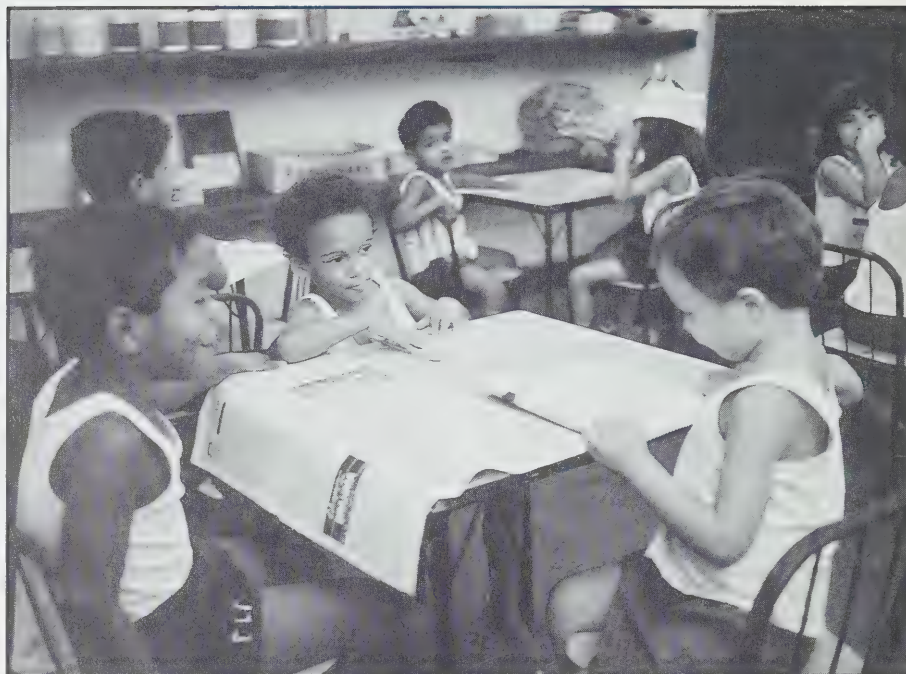
Dr. da Fonseca has been trying to analyze the incidence rates of respiratory and infectious diseases among 400 children in the city of Fortaleza, who attend the same nursery there, and also among 400 other youngsters who are cared for at home by a member of the family. He intends then to compare the scope of the problems in each environment.

Another doctor, in the Department of Preventive and Social Medicine at the University of Campinas in the State of São Paulo, Doctor Aluisio Barros, has been observing the state of health of one thousand children in various of the 40 nurseries in the city of Campinas.

For eight weeks, pediatricians collected data on the health of each child, its socioeconomic situation, its medical history and that of its family. Researchers then proceeded to examine the nurseries selected, determining the number of diseases reported each month, identifying their causes and studying their potential association with the services provided, analyzing the possibilities of transmission, contagion and allergy in the dormitories, classrooms, bathrooms and kitchens.

The research currently underway is the first to be conducted in the daycare environment, and represents the follow-up to an earlier IDRC project. The project is in two parts: one being conducted by Dr. Barros in Campinas is supported financially by IDRC, while Dr Fonseca's project is supported by the British Overseas Development Agency (ODA). "We want to establish a clear comparison between the incidence of reported diseases at home and those detected in daycare centres," Dr. da Fonseca stresses. "We want to find out what kind of nursery is most susceptible to the transmission of childhood diseases and what role they play in the overall public health problem. There is no doubt that this research will help us to improve the current situation. The administrative and medical personnel, the community health workers and the parents involved in the research are already very conscious of the scope of the problem. The political authorities are also aware, but they do not know what to do."

According to Dr. da Fonseca, the epidemiological data collected will allow the country's managers and officials to design social and health policies based on facts. "Decision makers will finally have to recognize the importance of these data in planning and developing health pro-



IDRC: Denis Marchand

Data from the study of daycare centres will allow authorities to design better health and social policies.

grams, strategies and financial priorities," he says. "The data will also be useful to them for knowing whether there will be an increase or a decrease in the prevalence of respiratory diseases over the next few years. Then they can compare the situation with that in different regions of the country, or even of the world. Furthermore, other researchers will benefit from the dissemination of these data and our methodology," adds Dr. da Fonseca.

For his part, Dr Barros stresses the economic advantage of this research. "The costs of services are high, and it is important to get full value from them. In a daycare centre with 150 children, there will frequently be 30 working staff. Their salaries, in addition to those of the administrative, maintenance, security, cooking and laundry personnel (not to mention the costs of food and construction costs) represent a major budget, one that could easily be doubled to meet all the growing demands," he stresses.

"Is the government going to continue to subsidize daycare centres if they are still going to be a place for catching diseases?" asks Dr. Barros.

"Will it invest in building new centres, before the problem is solved? If we do not have precise information, it will be hard to convince the government authorities to spend money in support of improvements for daycare."

"On the other hand," Dr. Barros concludes, "If the researchers confirm that the risk of disease is greater in the daycare centre, and if they give the reasons why, then the politicians will want to do something about it."

Denis Marchand in Brazil



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SUSTAINABLE FARMING IN THE PERUVIAN AMAZON

Years of agricultural research appear to have paid off in the Pucallpa area of Peru's Amazon region, despite interruptions by terrorist activities. Farmers now have new options for forage and food crops that significantly improve the prospects of sustainable and economically viable agricultural production.

Pucallpa, a city of 250,000 people on the Ucayali River, is the connecting port between the Peruvian Amazon and the rest of Peru. For 50 years, the area around Pucallpa has witnessed deforestation at a rate of 20,000 hectares per year. Present policies in Peru do not promote destruction of the forest. However, the degree of poverty in the degraded lands of the Andean highlands is such that migration continues to the tropical lowlands.

The new settlers from the Andes clear and burn the lowland forest to harvest one or two crops of rice, maize, cassava and bananas, mostly for subsistence in traditional production systems of shifting cultivation. Any profits from the sale of surplus

production are invested in cattle to counteract Peru's high inflation. Cattle and low-productivity pastures — supporting only half a head of cattle per hectare — are the main features of local production systems.

The problems of deforestation and land degradation have inspired research efforts by Peruvian institutions such as the Veterinary Institute for Tropical and Highlands Research (IVITA), the National Institute for Agricultural Research (INIA) and the Agricultural Development Foundation (FUNDEAGRO). They have been joined by international organizations such as FAO, IDRC and the International Centre for Tropical Agriculture (CIAT) in the development of new farming technologies.

Five years ago, the Shining Path guerrilla group destroyed IVITA's main research station at Pucallpa. Files with decades of research were lost, but for researchers at institutions in the area the event was seen as a challenge to continue research activities. Moreover, the loss of the research station provided greater incentive to pursue the project objective of working directly on local farms. Farmers thus became research partners, and opened their gates to experiments and trials on their land.

This partnership between IVITA scientists and farmers had a solid foundation in over 25 years of local work. The Institute had characterized production systems, introduced new pastures species, developed soil management techniques, and adapted dairy-beef cattle, based on European and zebu crossbreeds, for the hardship conditions of the humid tropics.

The collaboration between IVITA and IDRC began in 1981 through the Amazonian Production Systems (SPA) project. In 1985, CIAT joined these activities by establishing its major germplasm screening site for the Amazon as the scientific backstop for another IDRC-supported project, the International Tropical Pastures Evaluation Network (RIEPT), which involves over 50 institutions in Latin America.

As a result of CIAT's work, thousands of ecotypes of grass and legume species with forage potential — representing the biodiversity of Asia, Africa and tropical America — were screened under stresses of poor acid soils, high aluminum (Ultisols), and disease and insect pressures typical of the region. Emphasis was given to selecting material with high productivity, high feeding quality,



The Peruvian Amazon has seen an influx of small farmers from the impoverished Andean region.

and deep rooting and nutrient cycling capacity.

Unfortunately, CIAT had to leave the area temporarily in the late 1980s due to the difficulties of operating with foreign scientists under terrorist threat. By 1992, the security situation had improved sufficiently for FUNDEAGRO and CIAT to continue their research, in association with IVITA, within a new IDRC project, "Sustainable Amazonian Systems" (SAS). The purpose was to assemble agro-silvo-pastoral production systems (integrating crops, trees, pastures and animals) and evaluate them for biological and economic sustainability.

The earlier SPA project had improved incomes and sustainability in the medium term for small farmers producing milk and beef. Many small farmers had adopted *Brachiaria decumbens* to replace other grasses introduced in the early 1960s. However, "several issues had to be resolved in terms of systems sustainability in the long term," recalled Dr. Alfredo Riesco, IVITA's SAS project coordinator. "Although *Brachiaria decumbens*, a grass well adapted to poor acid soils, is highly competitive in the long run, soil compaction is an important threat to pasture sustainability, particularly under the constant pressure of the common grazing system in the area."

To improve sustainability, the SAS project uses superior technologies developed in Pucallpa or elsewhere in the Peruvian Amazon. These include soil management, new timber species with rapid growth, and native fruit trees, as well as grasses, legumes and crops tolerant to acid soil, to reclaim degraded lands.

"The objective of integrated agro-silvo-pastoral systems is to find biological and economic alternatives for farmers. This includes an adapted crop that will pay for the establishment of other components, timber trees and fruit trees with market demand and grass and legume species for grazing and cover under tree plantations," explained IVITA agronomist Hugo Ordóñez.

Several integrated systems are now being tested in farmers' fields,

FROM THE AMAZON TO SOUTHERN CHINA

The legume *Stylosanthes guianensis* CIAT 184, 'Pucallpa,' has proven its value as a high-quality feed for animals and as a legume that improves soils. Outside Peru, its attributes are recognized in other Latin American countries.

But the largest current impact of *Stylo* Pucallpa is in South China's provinces of Guangdong and Hainan Island, where it is called "Pihua-do." Its use as a forage legume to improve the diet of pigs and poultry and as a cover crop for rubber and mango plantations is spreading in the country's most tropical provinces.

The cultivar originates in Colombia's Cauca Valley, where it was collected and initially evaluated by CIAT. In 1978, CIAT sent this experimental material to institutions in Latin America, including IVITA. Later, as part of the IDRC-financed International Tropical Pastures Evaluation Network (RIEPT), it was tested along with other forage grasses and legumes at more than 30 sites in Latin America's humid tropics, explained Dr. Jose Toledo. He witnessed the cultivar's development as a member of IVITA, CIAT and FUNDEAGRO.

At the invitation of the South China Academy of Tropical Crops in 1983, CIAT staff visited South China. Dr. Toledo took along packages of promising experimental materials, including *Stylosanthes guianensis* CIAT 184. These materials were planted for the first time on Hainan Island. The Australian *Stylosanthes guianensis* 'Graham' had been introduced there previously, but it is susceptible to anthracnose, a fungal disease.

Due to its high productivity and resistance to anthracnose, cropping of *Stylo* Pucallpa expanded to Guangdong Province, where today there are more than 133,000 hectares, equivalent to 4.7% of the province's cropland.

replacing degraded areas with young secondary growth and "purma," secondary forest that is 10 or more years old.

"We have to provide alternative technologies and adapted components for farmers to stop deforestation. Because of their tradition of shifting cultivation, farmers are inclined to deforest more and more in order to plant subsistence crops. The new technologies will provide an opportunity to raise their incomes through minimum purchased inputs and maximum use of already disturbed and degraded lands on their property," explained FUNDEAGRO extension officer Kenneth Reátegui.

One tree component in the system — chosen for its rapid growth and potential market demand — is Bolaina (*Guasuma trinita*), a softwood tree mature enough for harvest after just 7 to 8 years. This tree — native to the region — is used traditionally for rural construction, including houses. Marketing studies show potential demand for this light wood in Asian countries.

THE RIGHT RICE

Rice is the traditional crop for farmers using shifting cultivation.

FUNDEAGRO introduced 12 experimental lines of upland rice from CIAT, developed specifically for the poor acid soils of South America's savannas. Local cultivars have serious production problems due to weak root systems and susceptibility to pests and diseases.

Dr. Miguel Ara, the FUNDEAGRO scientist participating in the SAS project, was in charge of evaluating these rice varieties for use in a new production system. He chose a line that almost doubled the productivity of local varieties under controlled plot conditions.

Under actual farm conditions, the new rice line also gave good yields. It compared well against the local rice variety, Chancabanco, which requires more inputs to grow in degraded soils. Although Chancabanco resists *Piricularia* (a common fungal disease in the tropics), it yields only 2,200 Kg/ha, while the new rice yielded 3,100 Kg/ha in farmer's fields, said Fulvio Hidalgo, a seed production specialist working on the project.

Local farmer Hipólito Tomaylla had experienced failure the previous year with a crop of Chancabanco, planted in the traditional way. "But

this year, with technical assistance from FUNDEAGRO, I planted the new rice, called "Palmero" because the first farmers trying it are palm-tree growers," he said. "I didn't have any problem with this rice," Tomaylla added. "No pests and the yield was more than 3 tons per hectare. I had no trouble selling it in the market at a good profit."

The new rice is being planted by other local palm-tree growers, within a FUNDEAGRO project that helps farmers adopt technologies generated by the SAS project by providing credit and technical assistance. The project is supported financially by the Peru-Canada Counterpart Fund of the Canadian International Development Agency.

Another plant — the legume *Stylosanthes guianensis* 'Pucallpa' — has an important role in the new production system. Stylo Pucallpa was released commercially by IVITA in 1985 after several years of evaluation. It is a nitrogen-fixing complement to the grasses in the area. This legume can be used alone for soil improvement, as a nitrogen-fixing legume for cover crops in plantations, and to feed animals. Therefore, it is an ideal component for low-input sustainable agriculture.

The new production system consists of planting and harvesting a crop of rice. Next, rows of oil-palm seedlings are planted along with Stylo Pucallpa. This system eliminates costly weeding in the space between the palms and introduces nitrogen to the soil. Until the oil palms begin production after three to four years, the system also provides farmers good income based on the initial rice harvest and on dairy-beef production from animals fed on Stylo Pucallpa.

Another production system is the use of mixtures of grasses and legumes for dual-purpose dairy-beef cattle. "From my point of view, the *B. decumbens* and Stylo Pucallpa mixed pastures are wonderful because they contribute to continuous and high milk productivity of cattle," said Artemio Noriega, a small farmer who migrated from Peru's impoverished central highlands. One



Zoraida Portillo

An important component of integrated farming systems, Bolaina trees are ready to harvest after ten years.

of the earliest settlers, he has been able to gradually accumulate 30 ha and 70 head of Brown Swiss and Holsteins crossbred with zebu. These crossbreeds were promoted through an earlier program of IVITA.

"In the field, we always find native pasture, but of low productivity," Noriega added. "Before the research project we had 'yaragua' (*Hyparrhenia rufa*), which rapidly degraded after grazing. Today we prefer to plant *B. decumbens* and Stylo Pucallpa because they are better adapted to the soils and give good results. The mixed pasture is palatable to milk cows, and steers rapidly gain weight".

Research results accumulated in the area are being used not only by small farmers but also by local enterprises. The San Juan brewery in Pucallpa is interested in developing plantations of native fruit trees for the soft drink industry. Its agronomist, Manuel Chuquiruma, was surprised to learn that *Arachis pintoii* and *Centrosema acutifolium*, two nitrogen-fixing forest legumes used as cover crops in plantations of the native fruit trees camu-camu and pijuayo, are the result of interna-

tional research. "I had no idea who developed these technologies, but they were a very important contribution, because this cover provides a reasonable way to manage tree crops in the humid tropics, where we have low-fertility soils," he declared.

Despite the general success of research to date, Dr. Miguel Ara provides a note of caution: "The so-far successful components being assembled in integrated systems are still new. They require further evaluation over time to be sure about their interactions and their contribution to sustainability of production systems."

"However, the first computer simulation clearly suggested that the association of crops like Palmero rice, Bolaina trees with high market potential, and grasses and legumes is a good approach to reclaiming degraded lands with sustainable and high-yielding systems," Ara added. The fact that small farmers are already adopting some of these techniques and are satisfied with the results is also encouraging.

In the meantime, the region's farmers are recovering hope for a better future. The drastic reduction of terrorism is one positive factor. And the new production options allow farmers to foresee a future that avoids the need to go through the cycle of deforestation, land degradation and low productivity in the struggle to escape poverty.

Zoraida Portillo in Pucallpa



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A CRITICAL MASS OF AIDS RESEARCH

Since its emergence in the early 1980s, AIDS has become the African continent's biggest health threat. It is already the number one killer among adults in some sub-Saharan countries.

The World Health Organization estimates that by the year 2000, 40 million people worldwide will be infected with AIDS or HIV, the human immunodeficiency virus that triggers the killer disease. Of those, 25 million will be in Africa. Thus, Africa appears destined to continue to bear a disproportionate share of the AIDS pandemic.

In this environment, IDRC is supporting a collaborative research effort by the University of Nairobi and the University of Manitoba intended to find ways to protect certain vulnerable groups. The team of African, Canadian and European researchers is led by the University of Nairobi's Dr. J.O. Ndinya-Achola and the University of Manitoba's Dr. Frank Plummer. Plummer, a Winnipeg native, has conducted research on AIDS from a base in Nairobi, Kenya for some 10 years. Over that period, the research has included studies focusing on three diverse but important groups affected by AIDS: sex workers (prostitutes), children, and long-distance truck drivers. Plummer's collaborators in the 70-person team have become one of the most prominent AIDS research groups in the world and certainly the best known such research team in Africa.

Some of their most remarkable findings to date have emerged from a study of 1,700 Nairobi sex workers, 95% of

whom have AIDS or are infected with HIV. The researchers are trying to determine why the remaining uninfected five percent — whose behaviour is apparently no different from that of their cohort — have not acquired the disease.

"We're very interested in how they resist HIV infection," says Plummer.

Something makes the AIDS-resistant sex workers special. "We're pretty sure they're resistant to HIV in some way," says Plummer. "They could have cellular immunity to HIV. There's something about their white blood cells that kills the disease." Finding the answer could mean a cure, or at least a vaccination, for AIDS. "It's the best clue in determining if there is a natural immunity," he says.

Dr. Joanne Embree, of the University of Manitoba's Medical Micro-

biology and Pediatrics Department, says "if the prostitutes have an immune defence mechanism, then you're well on your way to finding something to cure it or at least minimize the effect of AIDS." And if researchers determine the women are genetically immune to the virus "we can look at gene therapy or something to block the (genetic) receptor."

MOTHER TO CHILD TRANSMISSION

The group is also trying to determine the role of breast milk in HIV transmission between mother and baby. Out of 500 children of HIV-positive mothers, 47% were infected with the virus. Half of those children were infected through breast feeding.

"That's an incredibly important issue," says Plummer. "Breast feeding

is almost universal in Africa." And for impoverished women, without the resources to buy food or provide clean water, there is no alternative to breast feeding to nourish an infant. Even if there were a choice, the benefits of breast feeding in developing countries cannot be overlooked. They are vital to the health of the child in the first few years in the prevention of disease, particularly potentially fatal diarrheal diseases.

This study is not yet complete but already the researchers think that a three to six-month period of breast feeding rather than the suggested two years may be a better practice for HIV-positive mothers. The researchers hope that a shorter period of breast feeding will lower the transmission rate of HIV while still giving the babies the necessary immunities to fight other diseases.



Nairobi. The potential for mother-to-child HIV transmission must be carefully balanced against the benefits of breast feeding.



Researcher Dr. Job Bwayo examines a patient at the truck drivers' clinic on the outskirts of Nairobi.

Cheryl Albuquerque

Plummer says the research group initially focussed mainly on women and children: little research was directed toward hard-to-reach men. Then, as part of a study led by the Kenyan researcher Dr. J.J. Bwayo, they set up a roadside clinic near a police checkpoint to contact truck drivers, who generally have a high frequency of HIV and other sexually transmitted diseases.

"There is a lot of HIV along the truck routes," says Plummer. They are a mobile population who play an important role in the geographic spread of HIV. It has even been suggested that long distance truck drivers may, in part, be responsible for introducing HIV to Kenya from neighboring countries.

Of the 800 men in the study, about 30% have HIV, a figure that is growing by about four percent a year. Plummer calls the roadside bars and truck stops that the drivers frequent "little HIV factories." Research has shown a higher prevalence of HIV in towns near major highways than in nearby towns further from the road.

In 1990, the project interviewed 350 long-distance truckers. Despite having adequate knowledge of AIDS and other sexually transmitted diseases, 80% reported having had unprotected sex with prostitutes

within the previous year and 25% reported weekly sex with prostitutes. Only 10% had ever used a condom.

The roadside clinic attempts to change attitudes about unprotected sex. While drivers wait for police to check their rigs, they are offered HIV tests as well as condoms, education and counselling. "Most everybody in Kenya and Africa knows about HIV but they don't do what they ought to," says Plummer. "We're trying to understand the impediments to translating knowledge to safer behaviour."

If AIDS continues at its current pace "within 10 to 15 years you'll be able to see effects on population growth," says Plummer. "There'll be negative population growth. Right now, 15% of the general population have HIV in Kenya. When 15% of your workforce have a fatal disease, that's pretty important."

Exacerbating the health crisis are governments too poor or too slow to combat the problems. Annual health-care spending amounts to only about \$6 for every man, woman and child in sub-Saharan Africa, according to the World Development Report. "Government's are not putting enough money or resources into the problem of AIDS," says Plummer. "They can't hope to cope with the

problem with the money they have right now."

LOCAL IMPACT

The research by the Kenyan-Canadian team, along with the educational and counselling components, has made a considerable contribution to slowing the transmission of sexually transmitted diseases in Kenya and beyond. "We've helped a lot of people along the way. We've prevented countless HIV infections," says Plummer.

But the research program has had other important results apart from its findings on sexually transmitted diseases. From modest beginnings, when Plummer and one or two Kenyan colleagues worked on small studies, it has grown into a sophisticated, world-renowned research team. Sixty members of the 70-person team are Kenyan.

"We've built the human resources to begin to deal with this problem," says Plummer. "We've built a fantastic research and training facility. We've trained a lot of Canadians and Kenyans. These studies aren't possible anywhere else in the world."

Embree underscores the importance of the Canadian-Kenyan partnership. "With African investigators much more work can get done," she says. "There is much more cooperation and help. It would be a lot slower and not as well done if the Kenyan investigators weren't working alongside. They've been a great asset. And the expertise will stay in Africa no matter what."

Jim Beatty in Nairobi



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CRIME AND URBAN DEVELOPMENT IN PERU

Throughout much of the 1980s and early 1990s an atmosphere of violence, insecurity and fear marked the daily lives of Peruvians. Using tactics of terror and extortion, two guerrilla groups competed for political, economic and social power alongside heavily armed drug traffickers and sophisticated bands of kidnappers and robbers.

In this disturbing context, Peruvian researchers at the Centre for the Study and Promotion of Development (DESCO), supported by IDRC, set out to investigate rising levels of urban crime in the capital city, Lima, where about a third of Peru's 22 million people live. (A related study was conducted in Guayaquil, Ecuador.) Their goal was to chart major trends in urban delinquency, to determine enabling factors, and to evaluate how people and institutions perceive and respond to the problem.

What became evident, says project leader Abelardo Sánchez León, is that more than a decade of violence, coupled with a severe economic and social crisis, have distorted both people's perception of crime and society's ability to respond.

"The concept of crime has become ambiguous," says Sánchez León, a sociologist. "People's perception of crime is relative to profitability. The more lucrative a crime and the better the chances of not getting caught, the more the negative aspects become relative."

Underlying this logic is the dramatic deterioration in Peruvian living standards and the growth of multiple forms of violent crime throughout the 1980s.

While the violence by Peru's two guerrilla groups — the Shining Path and the Tupac Amaru Revolutionary Movement — was politically motivated, their methods, ranging from extortion and bank robbery to assassinations, were typical of those used by common criminals. Adding to the confusion, members of the police, the armed forces and several para-



DESCO: Carlos Dominguez

Crime in Lima is increasingly complex, with the involvement of the poor, the police, government and drug traffickers.

military gangs often posed as guerrillas to commit crimes.

THE COMPLEXITY OF CRIME

The increasing variety and sophistication of criminals make tracking delinquency in society difficult. New forms of crime include drug-trafficking, elaborate forms of assault and robbery, and the corruption of government employees, police and armed forces personnel.

Peruvian newspaper headlines reveal the extent of the problem: "More than 100 police belonged to crime gangs in the past two years. Drug-traffickers use chemical products robbed by common criminals. Army investigating at least 100 officers for possible connections to the drug trade."

Weapons and grenades used by the Destroyers, an extortion band, were all traced back to police stations in Peru's interior. Most of the gang members were former police officers. In another recent case, dubbed "crime of the century" by the media, robbers, with inside help from a security company, ambushed an airport and lifted \$2 million in cash from two airplanes.

These new and shadowy forms of crime blur the line between legality and illegality, says Sánchez León. Modern crime organizations, like

drug-trafficking networks, need to maintain links, either through corruption or threats, with the formal system — embodied by the government, security forces, or financial institutions — in order to operate. These links create new centres of power alongside the formal system, with the help of people inside that system.

"The strength and growth of modern crime organizations is based on their connections with the social system and the spheres of power," says Sánchez León. "The complete opposite is true for common crime."

Not surprisingly, researchers found that those involved in petty crime were usually the marginalized of society. This group included the poor, who tend to resort to petty theft or illegal activities simply to survive or to complement meagre incomes. Both President Alberto Fujimori and the mayor of Lima, Ricardo Belmont, have said that most Peruvians have only two alternatives: they either work in the informal sector or turn to crime.

CRIME AND SOCIAL CHANGE

What is new is society's minimalization and rationalization of petty crime in the face of a widening gap between the rich and the poor and an upsurge of violent crime, the

DESCO researchers found. Delinquency has become part of a broader process of social decomposition in which people collectively adopt deviant behavior because there are few opportunities to obtain their goals legally. This process has been fuelled by large migrations of rural inhabitants to the cities, unalterably changing a social order that has still not adapted to the needs of a larger, more diverse population.

An important part of the DESCO study is devoted to putting a human face on the crime problem. "Many studies on urban development look at the living conditions of people in cities, but have no people in them," says Sánchez León. Therefore, DESCO surveyed attitudes in three different neighbourhoods toward criminals and crime and interviewed inmates at Lurigancho, one of Peru's most populated jails. The results are detailed in a companion book to the DESCO study called *En el juego de la vida: Ser delincuente en Lima* (In the Game of Life: Being a Delinquent in Lima), written by Sánchez León and Marco del Mastro.

"What surprised me," says Sánchez León, "was people's image of who is a criminal. The criminal is not necessarily someone who commits a crime but is the person who gets caught."

According to the DESCO research, those who go to jail often become victims of a system meant to rehabilitate them. Inmates described Peruvian jails as a microcosm of life on the outside where those without resources often fall prey to exploitation and abuse, sometimes by the very officials who arrest them. Most inmates must pay guards or other prisoners for basic services and protection. The majority become drug addicts, thus perpetuating the circle of crime: they usually steal to feed their addiction once they are released.

While the Peruvian government has recently begun to reform the justice and penitentiary system, DESCO researchers found that, in general, the institutional response to urban delinquency has ranged from inaction due to a lack of resources to corruption and complicity. Real action only seems forthcoming when delinquency affects middle or privileged sectors of society.

Rising levels of violent crime have had a deep impact on the urban environment. Both personal firearms and private security services are in great demand. The DESCO study revealed that Lima now has about 2,000 security firms and some 312,000 people carrying firearms. The affluent increasingly live and work behind high walls, bars and

security systems. These changes reflect a growing trend in other large cities in Latin America also hard hit by economic and social crisis. Because police patrols are largely assigned to middle class neighborhoods and the downtown core, it is not unusual for residents of shantytowns to take the punishment of offenders into their own hands.

In light of their findings, the DESCO researchers made a series of recommendations intended to improve the management of national police forces; strengthen their links with departments of crime prevention, human rights protection, drug traffic and terrorism; increase respect for democratic and constitutional principles; and decentralize the forces at the municipal level. The DESCO recommendations also included measures to involve the citizenry in police reforms, to examine structures for determining positions and promotions, to establish an outside body to monitor police forces, and to improve morale and wages in the forces.

Until now, few researchers had focused on trends in urban delinquency and criminality and how they affect urban development and society. Putting together a more comprehensive picture of the complex nature and reach of crime within society, as researchers at DESCO have attempted, could lead to more effective management of urban violence and better strategies to deal with such problems in the future.

Kathryn Leger in Lima



Many Peruvians on the margins must choose between work in the informal sector or turning to crime.



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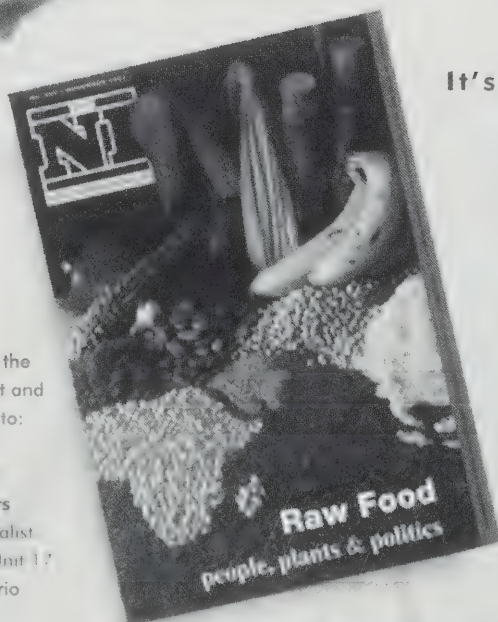
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FOCUS

The path from the 1992 UNCED Conference in Rio de Janeiro to a global Convention on Desertification — an initiative pursued with particular interest by African nations — will have taken some two years of careful and, at times, painstaking negotiation. IDRC is pleased to have supported participation by African NGOs and other key players in the negotiating process.

The importance of this convention can be measured alongside those on Climate Change and Protection of the Ozone Layer. Its great significance lies in the seriousness of the issue it addresses and its utility as a framework for action to protect the environmental integrity of arid, semi-arid and dry sub-humid areas. Success in this regard could help secure the livelihoods of all those who rely on the natural resources of the threatened areas and safeguard the food security of millions of vulnerable people.

With the completion of the Convention comes the difficult work ahead: developing national action programs and securing sufficient funding to carry them out. If the Convention is not to become 'just another document,' in the words of Bo Kjellen, Chair of the intergovernmental negotiating committee, this work will require the further long-term commitment of resources and energy on the part of governments, NGOs, local communities and bilateral and multilateral donors.

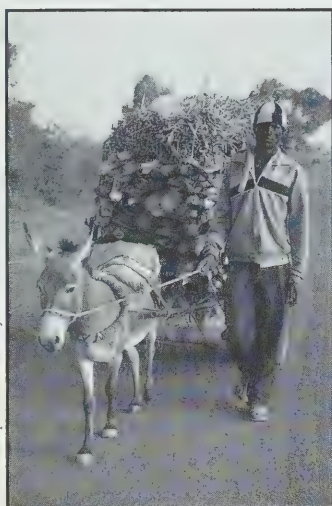
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REPORTS

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DESERTIFICATION: THE WAY FORWARD

The ecological crisis associated with desertification has by no means gone unchallenged by the global community. Indeed, nearly twenty years have passed since the United Nations Conference on Desertification (UNCOD) in 1977. Despite past responses, the battle against desertification has achieved little and it is time to draw lessons from past experience in order to plot a new course.

Past efforts to combat desertification have tended to use "top-down" approaches concentrating on technical means to halt, control or reverse land degradation. They assumed that traditional systems required major transformations, that governments would develop and transfer new sustainable land use practices to rural areas and that involvement of local communities was neither necessary nor desirable.

Since the early 1980s, however, there has been growing recognition that without the integration of local people's socio-economic and cultural realities, the transfer and application of the world's best technologies cannot solve the problem of desertification. This latter point has been identified by most development agencies as a primary reason for the failure of most anti-desertification projects in the 1970s and 80s.

Realities such as local institutional and authority structures, class, ethnic and gender relations, inter- and intra-household dynamics, markets, trade and economic incentives, labour and migratory patterns, and land tenure and management arrangements all have profound effects upon the success of any development efforts, including projects addressing desertification issues. Integrating these realities into such projects cannot occur without the full participation of local people in all parts of project design and implementation. The need for a "bottom-up" approach

DEFINING DESERTIFICATION

Desertification is defined as "land degradation in arid, semi arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities" (UNCED, Agenda 21). Land degradation means a reduction of the biological and economic productivity potential of rainfed cropland, irrigated cropland, or range, pasture and forest land by one or a combination of processes, including, among others:

- displacement of soil materials by wind or water erosion
- deterioration of soil physical and chemical properties
- long-term loss of natural vegetation.

Desertification is different from drought, although the problem of human-induced land degradation is intensified whenever drought occurs. Drought means a sustained and regionally extensive deficiency in precipitation causing a serious hydrological imbalance.

Desertification is estimated to involve about :

- 73% of the rangelands, 47% of the rainfed croplands and 30% of the irrigated lands in the drylands, thus affecting more than 3.6 billion hectares of the total world area of arid, semi-arid and dry sub-humid lands.
- About 25% of the total world land area.
- A loss of land productivity affecting 900 million people in more than 100 countries. Ninety of these 100 countries are in the developing world.

Half of the world's people most menaced by desertification live in the Sahel region of Africa. Within Africa, the largest contiguous arid land mass on the continent is the Sudano-Sahelian zone, stretching from Senegal in the West to the Sudan in the East. However, drylands (arid, semi-arid and sub-humid) are found throughout Africa and in large parts of Asia, Latin America, Australia and the United States.



World status of desertification of arid lands (source: Dregne, H.E. 1983. *Desertification of arid lands*. Harwood Academic Publishers, Char, Switzerland).

concentrating upon both socioeconomic and technical issues is becoming ever more clear.

In addition, we have learned that the response to desertification must be integrated at local, national, and international levels. At the local level, integrated approaches to research and action are required to handle the systemic complexity of linkages between people and nature. As a rule, interventions should be "cross-sectoral," designed on the basis of interrelated local biophysical, socioeconomic, institutional and social aspects, factors and processes.

It is no exaggeration to say that the struggle against desertification will be won or lost at the household, community, and municipal level. Essentially, desertification has been facilitated by local



A key element of desertification control is to provide local people with opportunities to organize effectively and influence representative institutions.

people not having the means to use their resource base sustainably, as they used to. The causes behind the impoverishment of local people in terms of both lack of resources and lack of influence on decision-making processes are many and interrelated — insecure land tenure, population growth, short-term decision making intended simply to cope, and the general marginalization of local people.

On the basis of this diagnosis, in order to control or even reverse desertification, local rural people (via their community-level institutions) need to:

- have greater control and responsibility over their local resources;
- be able to command a greater range and level of resources to be more “resourceful”;
- participate in and influence higher-level decision-making processes that affect them; and
- be able to organize themselves more effectively by forming or influencing representative local institutions and interacting horizontally with institutions of other communities by means of locally controlled information and communication systems.

Women are often the principal household-level natural resource managers and the custodians of crucial knowledge about natural resource use and management. As such, they must have greater influence and control over their lives, over the natural resource base and its use, access to resources and credit, and effective participation in decision-making processes.

The empowerment of local people, women, communities and institutions requires an enabling environment at national and international levels. Such an enabling environment must have certain key elements. At the national level there must be more democratic, participatory and decentralized political and administrative structures. These structures would require devolving authority and resources over natural resource management to government levels as close as possible to local people and institutions at the forefront of using and managing natural resources, i.e. those whose livelihood depends directly on the integrity of the natural resource base.

Systems and policies for resource/land tenure and ownership must reflect existing socio-cultural diversity across local settings and allow statutory laws to build on local customary rules, instead of undermining them. Economic policies, structural adjustment approaches, and marketing structures should enhance local rural marketing possibilities and improve — or at least not affect negatively — the terms of trade between local communities and larger-scale markets and between rural and urban areas.

Local capacity for self-help should be fostered and technical and financial support provided to community institutions on the part of NGOs, governments and donors. Finally, formal education systems and policies should give greater weight to traditional local knowledge, combining it with modern scientific knowledge in natural resource management and use.

At the international level, an enabling environment for fighting desertification would require world trade patterns and policies that ensure access by poor developing countries to Northern and other Southern markets and allow these countries to build up and diversify their economic base. Some measure of protection for key sectors in poor developing countries may have to be allowed to support

CURRENT IDRC RESPONSE

At the Rio Conference (UNCED) in June 1992, African countries pushed for a Convention on Desertification and Drought. These countries have strong stakes in making the Convention a success. IDRC has been assisting African countries in building their capacity to make effective contributions to the convention process. These activities fall into six categories:

1. Compilation, synthesis and dissemination of IDRC's own projects on desertification in Africa.
2. Review, generation and dissemination of knowledge by organizing review studies and Pan-African workshops on the following key issues relating to desertification and drought:
 - a. indigenous knowledge and traditional coping strategies to prevent or adapt to land degradation (Cairo, January 1994);
 - b. land, tree and water ownership and access issues (Dakar, March 1994); and
 - c. impact of world trade, economic policies, and structural adjustment programs on land degradation in Africa (Nairobi, May 1994)
3. Assistance to key African NGOs in building longer-term capacity in informed national-level advocacy on desertification issues as well as in informing and participating in international negotiating sessions en route to the Convention.
4. Call for a donors' meeting to share experiences and develop a consensus for future collaboration.
5. Development of a Pan-African Research Network on desertification.
6. Support for the “Earth Negotiations Bulletin,” published daily during the negotiating sessions for the Desertification Convention.

fledgling enterprises that cannot yet compete globally. Trade policies should be consistent with international development assistance to avoid anomalies such as subsidized meat exports from the European Community to West Africa and parallel EC development assistance to small livestock owners whose livelihoods are being undermined by the exports. International donor assistance to the South should also be appropriately coordinated.

Finally, there is a need for the gradual reduction in foreign debt obligations, possibly linked to progress in creating a national-level enabling environment for sustainable local livelihoods and concomitant control of desertification.

WHAT WE DO NOT KNOW

The steps discussed above to create an enabling environment indicate that the essential elements in a framework for effective action on desertification are known. Most elements of the framework are reflected in the draft text of the Desertification Convention, which was fine-tuned at the meetings of the intergovernmental negotiating committee and is to be signed by September 1994. However, there is little experience in translating such a framework into action in specific local contexts. Many questions surround the application of relevant knowledge, technologies and experiences and their transfer from one place to another. Other questions persist about how to develop the local capacity for such application and experience and how to facilitate learning processes. It is here that further research on capacity-building and action is needed.

Case studies of different aspects (technical, economic, institutional, organizational) of particular desertification control measures and programs need to be identified and evaluated more systemically and the reasons for their success or failure pinpointed. Further, it is necessary to examine and experiment with capacity-building and learning processes at local and national levels.

Within the elements of the above framework, little empirical information is available about the interrelationships between world trade and structural adjustment programs on the one hand and local desertification processes on the other, nor on how macro-economic policies and market-based instruments can be used to control desertification (please see article on p. 13).

Further research is also needed on appropriate land/resource tenure forms. Such research would examine how customary and statutory tenure forms and contents intersect in particular contexts and how they can be made compatible; the effects of widespread privatization of resource tenure in drylands in Africa; and how diverse tenure systems could be developed and maintained (please see article on p. 11).

Another topic of great relevance is indigenous knowledge. The challenge is to effectively combine local traditional and modern scientific knowledge to address desertification problems (please see article on p. 9).

SUPPORTING LOCAL CAPACITY

A further key area where innovation is needed is in developing project and program modalities appropriate for local-level intervention. All too often, large amounts of relatively

IDRC-SUPPORTED PROJECTS

Over the last 24 years, IDRC has supported hundreds of projects in Africa that have researched, directly or indirectly, solutions to problems of land degradation and desertification. These projects explored:

- Components of dryland systems (soil, water, trees/forests, populations), their characterization, survey and analysis, and the development of techniques, methods and tools for the rehabilitation or improved use and management of such components.
- Specific methods and techniques for the control of erosion and desertification.
- Agricultural, forest, pastoral, and mixed production systems and methods to increase their productivity and sustainability.
- Social, institutional, cultural, demographic and political aspects of dryland resource use and management.
- Information and dissemination systems.

inflexible financial support end up undermining local capacity rather than strengthening it. This issue raises questions concerning project funding: what kinds of organizations should be supported, at what scale, with what mechanisms, by whom should they be controlled and for what precise purpose?

In parallel to the process of developing and implementing National Action Programs, empirical research in the coming years on the gaps in understanding desertification — including issues of land/resource tenure, indigenous knowledge, and the impact of world trade and economic policy — can be fed into national processes as they proceed in an interactive fashion.

With the signing of the Convention this year, the world now has a policy tool to fight desertification. Accompanied by appropriate research and coordinated action at the local, national and international levels, there now exists the opportunity to move forward in restoring environmental integrity for threatened areas and improving food security and economic options for affected peoples.

Saidou Koala (Ottawa), Hartmut Krugmann (Eastern and Southern Africa Regional Office), Eglal Rached (Middle East and North Africa Regional Office), and Ola Smith (West and Central Africa Regional Office) are Program Officers with Environment and Natural Resources, IDRC.

THE DESERTIFICATION CONVENTION: “NOT JUST ANOTHER DOCUMENT”

How should the global community formally address the urgent problem of desertification? The question can seem straightforward enough — until one steps into the meeting rooms where details are being worked out by the Intergovernmental Negotiating Committee for the Elaboration of a Convention to Combat Desertification, or INCED. Then the divergent positions of countries from the South and the North on a number of issues become clear. Nonetheless, after four formal negotiating sessions beginning in May 1993, considerable consensus was achieved before the final session in June of this year.

The recent history of the Convention goes back to the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992. African countries pushed for a Convention during the UNCED process, with the result that language was adopted requesting the UN General Assembly to establish an intergovernmental negotiating committee to negotiate the Convention. This action was taken, with the goal of finalizing a convention by June 1994.

Some of the major areas of disagreement during the negotiations dealt with the socioeconomic linkages to desertification. Many developed countries argued that socioeconomic linkages such as trade and poverty had not been satisfactorily proven and that some of these, trade, for example, are covered in other fora. They were also strongly opposed to having the Convention address

poverty alleviation in particular, while the Africans argued that poverty is an inevitable result of land degradation, and it must be addressed if the problem is to be solved. The depth of feeling on the issue was evident in the words of the delegate from Benin: “There is a clear-cut link between desertification and socioeconomic factors. We must address poverty eradication. I am shocked that the USA can propose to delete poverty eradication. To delete it is to negate 99% of the convention.”

A GLOBAL CONVENTION?

Underlying much of the debate was the call by developing countries for new and additional financial resources, which the donors adamantly objected to. Instead donor countries wanted to see more efficient coordination and more appropriate use of existing funds. This issue became apparent in debate around the meaning of the term “global,” a term central to the discussions in the introductory chapters (preamble, objec-

tives, definitions and principles articles). It was understood that if desertification were declared to be a global problem, then it would be seen as an interlinked North-South issue and the global community would be required to take responsibility to address it. The developed countries on the other hand, would only accept the use of the term “global dimension” in the preamble insofar as it describes the geographical extent of the problem. This disagreement naturally spilled over into the debate on the definition of desertification, which was only resolved in the fourth session when a small working group chaired by Prof. El Kassas of Egypt proposed to retain the Agenda 21 definition as a compromise.

In order to achieve compromise on certain issues, some texts were re-drafted in a more general format, for instance, those detailing the actions to be carried out at the local level. Others texts, however, were deleted altogether. For example, the text that called for abandoning trade practices

that undermine the efforts of local populations — such as subsidization of agricultural exports — was removed from the Convention.

Nonetheless, compared to the texts of other conventions, the draft Convention as it stands contains some important references to the concept of partnership between governments, NGOs, local communities and other actors to combat desertification. One example is Article 10, dealing with national action programs, which specifies the respective roles of government, communities and land users. The Convention also retains, albeit without any elaboration, references to the linkages of desertification with socioeconomic factors such as poverty, lack of food security, migration, and the impact of



IDRC: Danilo Anton

Dune stabilization in a Chinese desert. Along with vulnerable areas of the African continent, the Convention addresses parts of Asia and the Americas threatened by desertification.



IDRC: Stephanie Colvey

The Convention recognizes the central importance of partnerships involving communities, governments and NGOs in efforts to control desertification.

international marketing arrangements and debt.

The negotiation of the African annex only started during the fourth session in Geneva. The general feeling at the third session in New York was that the annexes should be brief (about two to three pages). However, John Tesha, an advisor to the African group who was involved in drafting the annex, argued that the annex should operationalize the provisions of the convention and should therefore contain sufficient detail to deal with region-specific issues. "So when we drafted the implementation annex for Africa, we had in mind the specific programs of interest to Africa," he notes. He says that these programs include water and energy issues, food security, aspects of trade and the international economic environment, popular participation, capacity building, poverty alleviation and early warning systems on drought.

BRINGING HOME THE CONVENTION

The real success of the convention, however, will be measured on the ground, in terms of how it is implemented. It is widely believed that the failure of the 1977 UN Plan of Action to Combat Desertification (PACD) was mainly due to lack of political commitment on the part of governments to implement the PACD as well as the absence of any institutional mecha-

nism to persuade governments to muster that commitment.

Franklin Cardy directs the Nairobi-based Desertification Control Centre of the United Nations Environment Program (UNEP). According to Cardy, "the trouble with PACD was that it was an agreement which said that UNEP should coordinate everything and hoped that somebody would implement something.... But by and large, there wasn't a real commitment of governments to really implement the plans of action and put programs in place. That's why we need the convention ... to generate the political commitment."

NGOs participating in the negotiations have also called for new and innovative ideas that institutionalize the spirit of Rio with respect to establishing partnerships between all sectors of society. They stress that financial mechanisms should ensure predictability, transparency and coordi-

nation at all levels. In New York and Geneva, NGOs proposed the establishment of National Desertification Trust Funds to be managed jointly by national governments, donors, NGOs and local community representatives. Their purpose would be to respond quickly to initiatives taken at the community level without being hampered by too much paperwork.

Meanwhile, financial resources and mechanisms for the Desertification Convention remain a hot issue. The relevant articles in the draft text are riddled with brackets, meaning that the wording had not been agreed upon. A contact group headed by Pierre-Marc Johnson of Canada and Bolong Sonko of Gambia was charged with producing compromise on the disputed articles for negotiation at the final June meeting. According to George Green, a Canadian negotiator in the contact group, "the main issue here is what is the most effective way to channel necessary financial resources to meet the priorities of developing countries, especially at the national and local levels." He adds that commitment has more to do with the willingness of the parties to do something and less with the language of the convention.

Realistically, the ratification process can take years to complete. It is therefore crucial that provisions be made to start implementing the Convention as soon as possible after the final negotiating session in June. During the closing plenary at the fourth session in Geneva, Bo Kjellen, the INCD Chair, suggested there be interim arrangements for provisional implementation similar to the measures taken to advance the implementation of the Climate Change Convention. It is expected that Kjellen will present a resolution on urgent action to be taken for African drylands. This action would be in keeping with the priority given to Africa. Although he did not give details, Kjellen mentioned that a trust fund might be started for this purpose, "to demonstrate that this (Convention) is not just another document."

Wangu Mwangi, EcoNews Africa in Nairobi

SUPPORTING NGO INPUT

Many NGOs involved in lobbying on desertification issues at the national and international levels are hampered by insufficient knowledge of the main issues. To overcome these handicaps, IDRC launched a project to build the capacity of NGOs to engage in more informed advocacy in desertification issues, says Dr. Hartmut Krugmann, of IDRC's East African office. Five NGOs — in Zimbabwe, Nigeria, Senegal, Tunisia and Kenya — have been provided with the necessary resources to hire full-time staff for three years to work on preparation and implementation of the UN Convention to Combat Desertification.

Ann Heidenreich, of Climate Network Africa (Kenya), which is coordinating the project, adds that the project aims to increase the policy, analytical and networking capacities of these NGOs, to enable them to play a more effective role in providing relevant information, to link the NGO, scientific and policy-making communities, and to advocate on behalf of local communities at national, regional and international levels.

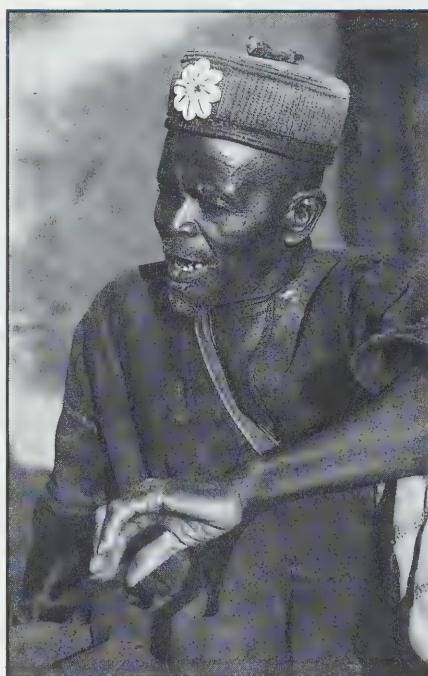
ANCIENT WAYS GUIDE MODERN METHODS

The sun had not risen when Shala left her family home in the Northern Maghreb. She enjoyed the early morning walk through the fields of her family's market gardens. Now in her seventies, she could remember walking behind her grandmother just as her youngest granddaughter was doing now. Together they listened to the birds, admired the dew glistening on the rows of vegetables and discussed the fact that fewer and fewer gardens were being cultivated.

Ahead of them lay a ridge marking the boundary between the gardens and the scrub-covered rangelands that stretched away to the mountains of the south. As the sun rose and the day warmed, Shala and her granddaughter redirected the flow of water coming from springs in the base of the ridge, to their garden plots. Shala was using a water collection and distribution system designed by Roman engineers two thousand years earlier. Known as horizontal wells, the skills required for their management have been passed down by word of mouth since that time. Today, availability of labour is a limiting factor in maintaining and operating the wells.

This and other examples of indigenous knowledge were discussed by more than 30 specialists at a workshop in January organized by the North Africa and Middle Eastern Regional Office of IDRC. The Cairo workshop focused on investigating the role of indigenous knowledge in the management of resources in arid and semi-arid areas. It revealed just how complex and dynamic are the systems of traditional land management based upon local knowledge.

Participants discussed situations where knowledge is being lost and land degradation and desertification are occurring due to the introduction of systems of agriculture that disturb the soils. Other factors of land degradation include changes in herd



Indigenous knowledge comprises a wide range of accumulated experience about natural resource management that holds value for policy making.

management, linked to limitations in freedom and scale of movement brought about by settlements as well as increases in populations and stocks. They also heard about examples where new lore is being gathered in response to changes in the environment. They recommended strongly that governments, and their officials, consider indigenous knowledge in the development and implementation of policies. The delegates also recommended that the preservation and protection of indigenous knowledge become a priority for policy makers.

OVERSTEPPING CARRYING CAPACITY

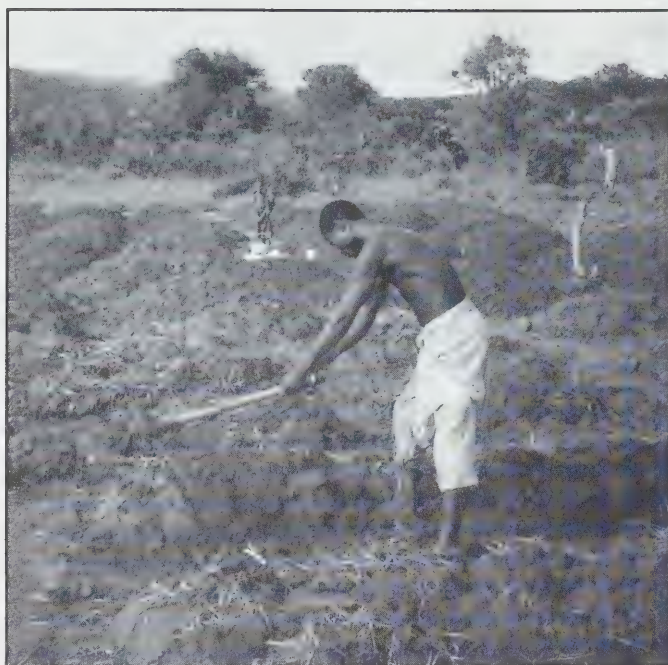
Dr. Mohammed El Kassas, widely honoured as the father of the environmental movement in Egypt, explained that when human activities overstep the natural carrying capacity of the land, a variety of factors and processes or "triggering events" lead to damage of the soil and desertification. He added that most drylands are charac-

terized by low and variable rainfall and fragile soils, which makes them very prone to desertification.

The containment of desertification involves a combined variety of corrective legal, financial, technical and policy actions that provide the basis for the sustainable development of land and water resources in affected areas. It is therefore important that local people, who are the holders of indigenous knowledge, be heavily involved in decisions affecting the resources upon which they rely. For this reason, participants recommended that analysts and decision makers take indigenous knowledge into full account when planning and implementing studies and development projects.

Traditional knowledge is often denigrated and ignored in the pressure to develop the countries of the developing world. Dr. Donald Cole, from the American University of Cairo, stressed that nomadic pastoralism developed as a specialized and highly skilled production system after the emergence of irrigation-based agriculture in the Middle East. This system provides a significant example of the development of indigenous knowledge in response to a specific set of environmental conditions. It also demonstrates that the incorporation by scientific knowledge of indigenous expertise is an important, although too often ignored, reality.

A major characteristic and advantage of indigenous management systems is the coherence with which local populations perceive, understand and integrate interactions between the different components of the milieu in which they live. Another important characteristic of these systems is their ability to adapt to the changing climatic conditions typical of their environment. In particular the workshop recognized that traditional pastoral and agropastoral communities had complex social and economic roles to play in their regions and, in fact, offered numerous sustainable responses to the degradation and desertification problems of the semi-arid lands. Because of their potential and socioeconomic importance, these dryland management techniques need to be protected and enhanced.



Paul Woomer

On a degraded savanna in northern Zambia, a farmer uses the composted, raised beds of the "fundikila" system, an example of local response to environmental change.

VARIATIONS ON NATURE

As Dr. Abdel Ghaffar El Ahmed, a Sudanese anthropologist, explained, "a distinctive feature of indigenous knowledge is that it encompasses the continuum between the landscape and the vegetation that exists upon it so that the two can be manipulated by people in the process of producing food." It should be understood, he continued, that African farming and herding is a series of variations upon the themes and processes observed within nature. Knowledge of ecological processes gives resource users the flexibility to direct processes to their own advantage. He added that "African countries need to redesign their self images and create a new science-led and culturally aware future."

More light was thrown upon the importance of indigenous knowledge in the lives of the people of Africa by Dr. Raphael Ndiaye, an NGO researcher from ENDA, Dakar. He believes that "all who are involved in development have to move from participation to partnership." Indigenous knowledge is important for the preservation of an individual's identity as well as for the preservation of a nation because, "a people without a memory is not a nation." He suggested to the workshop that strategies of communi-

cation must be developed that allow for the free exchange of information. "Messages must also go from local people to scientists and back again," he added.

It must also be remembered, however, that indigenous knowledge is owned by the people who hold it and use it. This means that while scientists and others should be able to work with communities in gathering information, the community and its members should have the ultimate say in how that information is used or to whom it is given. This issue raised considerable debate during the discussions. The participants felt strongly that indigenous knowledge was generally location specific and that its transfer to other locations and cultures was a complex process.

FEET ON THE GROUND

Discussion at the workshop highlighted the need to improve indigenous knowledge so as to improve modern knowledge. For their part, practitioners must be able to understand and appreciate the basis of the coherence and flexibility of the indigenous knowledge systems. Dr. Ndiaye reminded participants that "it must be remembered that the person who works and lives or dies with the results of development is the man working in

the field. The researcher, the development worker, the environmentalist, they all deal with complicated matters but each must have his or her feet firmly in the soil along with those of the farmer."

The workshop concluded that indigenous knowledge, as it relates to desertification, comprises a wide range of accumulated local experience about natural resource use and management techniques, institutional and organizational arrangements as well as beliefs and values. This traditional knowledge can certainly be enhanced by the infusion of modern scientific knowledge: the challenge is to evolve the right mix between the two. Hence, given the importance of successfully combining traditional and modern knowledge systems, research should be carried out on how to best achieve this aim. One source of information might be to study how adaptations and innovations are being incorporated into indigenous systems by local communities. In designing research and interventions the workshop recommended that the cultural, ethical, spiritual and institutional aspects of indigenous knowledge systems be given full consideration.

Tom Roach in Nairobi.

UNEARTHING THE IMPACTS OF LAND TENURE

1992. The rains did not show up in the area of Keur Momar Sarr, 240 km north of Dakar, capital of Senegal. The millet did not grow and neither did the peanuts. The figures speak for themselves: 900 tons of millet were harvested in 1992, compared with 40,000 tons the year before. The government declared these villages a "disaster zone."

In doing their sowing and trying to earn a little income, farmers and cattle herders exert anarchic pressure on the meagre vegetation cover: severe cutting and chopping down of trees and bushes to sell the wood in town; excessive pruning to make up for the lack of fodder. That year, recalls El.H Samba Sogui Bâ, President of the Nguer Malal cattle raisers, close to 90% of the livestock had to be moved to other pastures, sometimes as far as 300 km away in the south of the country.

1993. This year the rains came back. "The drought is over! The Ferlo is green again!" proclaimed the herders' spokesman, adding that in his village the rural councillors seemed ready to put a stop to extensive livestock raising. "They are handing out land for farming, without taking account of our needs for pasturage. And when our animals get into the fields, the farmers hit us with fines," he explains. He adds that, except in serious disputes, it is custom that prevails.

Twenty years ago, the old herder goes on, there was enough pasture and farmland for everyone. But now there are so many farmers — who are paying the price for shifting cultivation on burned-over land — that there is nothing left. The last fire, reported by a researcher from the Ecological Monitoring Centre in Dakar, had destroyed close to 80,000 hectares in the Ferlo the year before. These phenomena, which occur here and there throughout the Sahel, create shortages (of fertile land, food, wood), sometimes even after the rains come back.

To gain a deeper understanding of the relationship between landholding systems and desertification, a group of some one hundred experts from 17 African countries and several NGOs met in Dakar in March 1994. The meeting, organized by IDRC, dealt with "the impact of landholding systems and traditions of property and access to resources on land degradation and desertification in Africa."

Malarmine Savané, Secretary General for NGO Coordination in Senegal, recognizes that the land tenure problems linked to desertification have now become part of everyday life for rural people. This, he says, is because the modern concept of landholding rights is often poorly understood by farmers and even by the rural councillors who manage the area's natural resources. This problem is compounded by the lack of communication and information. Savané speaks of a "dialogue of the deaf" between the rural people who use the land and the proponents of traditional landholding systems, whether these are Islamic or modern. Not so, Ibrahima A. Touré seems to retort in his study, *Landholding Systems and the Struggle against Desertification*, "which invokes another reason. In Africa, he says, "the modern legal system does not consider pastoralism as a proper way of putting the land to use."

Farmers are no better off in many regions of Africa, however, "as long as they farm the fields of our ancestors in the village," says a farmer in Guanket,

in northern Senegal, "there are no problems. But whenever they try to *legalize* this property right or to acquire new land *legally*, the rural council stubbornly refuses." What happens then is that outsiders come and settle in.

THE WOMEN'S TOKERS: A SUCCESS STORY

Irrigated farming has been introduced in the once-dead Ferlo valley, and has brought it back to life. But women still constitute a marginalized group. Alima Touré, president of the N'Diobène Keur Women's Group, complains that only crumbs of land are parcelled out to her members: just 4 hectares for almost 40 women. Although Touré is well aware of the many obstacles to her chances of becoming a rural councillor (such cases are very rare), she is nevertheless determined to reverse this tendency. How? By sensitizing and informing her sisters better about their rights, and so helping them improve their living conditions: more farming income, various forms of education (literacy, market gardening, for example), and lightening the female workload. According to Touré, "if the farmer knows that his plot of land belongs to him, he will suddenly feel responsible, and will look after it properly and produce still more." Touré also cites the example of the *tokers*, these "traditional fields," located just behind the villages: well enclosed with live hedges of *salane* (of the

Modern property regimes that favour private land holdings impose constraints on pastoralism, a tradition well adapted to the semi-arid ecosystem.



CIDA: Pierre St-Jacques



IDRC: Stephanie Colvey

Women often have little say in the use of resources, despite the fact they are frequently the community members most knowledgeable about land management.

euphorbia family), these agro-sylvo-pastoral lots resist wind erosion and the effects of cattle grazing. In short, the women's *tokers*, having defied desertification, are still a success today.

Researchers presented similar examples at the Dakar meeting. Babacar Ba spoke of the *Schilab Lahmir* system, a natural resource management system based on the empowerment and participation of local communities in Mauritania. In the Mare d'Ouly region of Burkina Faso, Touré reported, traditional rights to use of the natural environment have been seriously disrupted by the incursions of man and livestock. But according to custom, he explained, the assigning of lands was a function of their potential for use: cultivation of the dunes or pastoralism in the non-cultivated areas. Result: the lands of the Targui chief Akam (which extend from Sagona to Sikiri) were the only ones to escape degradation of their vegetation cover over the last 30 years.

For the experts, the people themselves thus play a fundamental role in resource management and in the struggle against desertification. The experts point out that nearly 3 million people died during the 1980s in Sub-Saharan Africa as a direct result of this scourge. The situation is hardly more encourag-

ing when we realize that arid and semi-arid lands make up a third of the continent: 75% of pasture lands are desert, as is 60% of rain-fed agricultural areas and nearly 20% of irrigated lands. It is not surprising that at the Rio Conference in 1992, African countries demanded that drought and desertification should be recognized as a global problem that the international community must face up to. Thus, Chapter 12 of the Action 21 plan was devoted entirely to this double problem. Senegal's Minister for the Environment and Protection of Nature, Adboulaye Bathily, considers the struggle against desertification to be "a battle for civilization." The shape of African civilization will be dependent for thousands of years on the success of this undertaking, he says, and this is especially true for the countries of the Sahel.

In recognition of this, reforms are now planned everywhere in Africa, in Niger and Burkina Faso as well as in Senegal. But, stresses Ibra Ndiatte Ndiaye, President of the Regional Council of Louga, they will have to lead in the direction of a new way of land management, and ensure that the people are democratically involved in the decision-making process. This will require, he explained, that every vil-

lage must be equipped with a land title registry and in particular with socioeconomic statistics that reflect, for example, the number of inhabitants and cattle, the acreage devoted to agriculture and to pasture.

Although it may not have provided any "miracle solutions," the Dakar meeting, according to a delegate from Burkina Faso, Djiry Dakar, allowed people to grasp the many facets of landholding systems. This is a useful tool for taking up negotiations under the Convention on Desertification. Tidiane Gaid, for one, says that "for 20 years, states have tried to find solutions to the problem of desertification by stressing technology (anchoring of the dunes and reforestation programs, for example). Yet we have realized in recent years that people play a major role in resource management, and so the socio-economic aspects are very important. This is why the experts' recommendations are now stressing that the real solution to environmental degradation does not lie in privatizing the resources. Every country, they say, should be guided by co-management and should take account of the special characteristics of each land area.

Madieng Seck in Senegal

A MARKET FOR DRYLANDS AND DESERTS?

The depth of economic and environmental stress in eastern African nations is leading researchers to examine closely a sensitive topic: the links between global trade patterns and economic policies on the one hand and severe land degradation and desertification on the other.

The early evidence suggests these links are indeed extremely important. Nearly three decades of environmentally blind policies, especially in semi-arid and arid lands, have been compounded by the exigencies of international trade and structural adjustment policies whose design has not taken into account environmental considerations, further encouraging ecological deterioration and acute economic stress among local people.

Recent research indicates that deforestation and soil erosion are spreading at an unprecedented pace in the region. The looming environmental crisis spells a troubled future for the nations of this region, whose economies are largely dependent on agriculture — especially cash crops such as coffee, tea, tobacco and others. Kenya and Uganda derive 50% of their export earnings from coffee and Ethiopia 70%. This dependence on export crops leaves the already impoverished nations particularly vulnerable to fluctuations in the international markets, where they have little or no control over prices.

Following the plunge of coffee prices in the eighties and early nineties, for example, most of the governments responded by raising the acreage under the cash crop, usually in the most productive arable land. Increased exports require intensive use of chemicals such as fertilisers and

pesticides, which have been accused of causing grave ecological problems in Kenya and other countries.

MARGINAL LANDS

As the pressure to earn foreign exchange increases, food crop farming and associated population groups have consequently been pushed to marginal lands, with dire effects on the drier and less productive ecosystems. "The pressure on natural resources has reached a new high as the need for foreign exchange increases," says Dr. Mohamud Jama of the University of Nairobi. "In fact, irreversible damage may have been done in most of the countries of the region."

Jama is one of a team of researchers led by Dr. Nehemiah Ng'eno who have been conducting a review of the impact of world trade, economic policies and structural adjustment programs (SAPs) on desertification in eastern Africa under the auspices of IDRC. Similar reviews were carried out for other sub-regions of Africa for presentation and discussion at an IDRC-sponsored, Pan-African workshop held in May 1994 in Kenya.

Ironically, cash crop farmers are not spared the effects of the trade imbalance, which favours the North. The general distress caused by falling coffee prices has combined with spiralling input prices linked directly to structural adjustment policies to turn farmers in the prime agricultural Kiambu district in central Kenya into paupers, reports Mrs. W.N. Karugu.

Says the researcher: "Formerly relatively affluent smallholders became poor almost overnight. Standards of living fell dramatically, turning former 'necessities' such as education, medical services and savings into 'luxuries.'"

At the height of the crisis in 1991, desperate farmers operating without the benefit of government support schemes were unable to purchase quality inputs, which led to the soil being stripped of essential minerals and exposed to erosion. To meet their fuel needs, they indiscriminately cut down shrubs and trees. Some even uprooted coffee trees in defiance of the law, leaving the bare soils open to erosion by the elements.



Expanded production of export crops such as coffee beans can push food crop cultivation to ever more marginal and vulnerable lands.



Tourism in eastern Africa comes at the cost of millions of visitors and facilities development in environmentally sensitive areas.

In Karugu's words: "Escalating poverty merely encourages unsustainable land use practises as pressing immediate needs overshadow long-term considerations."

Smallholders disillusioned with poor and delayed returns from cash crops often shift to food crops. But these too have been hit in the recent past by low prices, population pressure, expensive inputs and environmental degradation following the breakdown of traditional farming systems.

As a result of these processes and recent severe drought, five million Kenyans presently need famine relief. The decline in food production means that the country must import 10 million bags of maize, 1.12 million bags of wheat and 200,000 bags of sugar.

Efforts to boost food production often means turning to semi-arid and arid areas with their attendant climatic limitations and the pastoral nature of local inhabitants. After a period of total neglect in the colonial and immediate post-independence era, the Kenya government moved in the late seventies to launch projects based on irrigation and designed to maximize food production. Despite their potential, these efforts have proved just as detrimental to the environment, prompting Jama to observe: "Where projects, especially those involving diversion from age-old cultural practices, have been imposed on the people by government, the results have been severe dislocation of the people and damage to the environment."

In her study on socio-cultural aspects of desertification, Mrs. Wilhelmina Oduol puts up a convincing case for the participatory approach to development planning, bringing together the community, non-

governmental organizations and the government to combine indigenous and modern knowledge to combat land degradation.

In the traditional order, environmental concerns were built into religious, political and economic activities. Taboos, beliefs, attitudes, social networks, division of labour and cultural practices were adapted to environmental needs. But the advent of the money economy and "mechanisms such as industrialization, urbanization, tourism, commercialization of agricultural and pastoral commodities" have broken down indigenous culture and habitats.

SACRED FORESTS

Oduol illustrates the point with the example of the allocation of religious shrine forests — known as makaya — on Kenya's coast to tourist hotel developers without regard for the wishes and advice of local residents. The forests, previously conserved diligently, have since been denuded in the process of constructing tourism facilities. The local people are left with no access to their shrines.

In fact, the tourism-related aspects of land degradation and inequitable distribution of benefits have lately gained a prominence all their own as Kenya seeks a viable alternative to agriculture as a major foreign exchange earner. Studies in popular tourist destinations such as the Maasai Mara have shown that even here success is not without its costs as hordes of tourists, estimated at one million in 1993, disturb the wildlife and environment with impunity, aside from the fact that local populations see none of the economic benefits.

But so long as eastern African countries remain embroiled in the debt

crisis, environmental considerations will be pushed to the back burner. Solutions to the dilemma must resolve inequitable financial arrangements and terms of trade that hurt the poor, says Jama, who suggests debt repayment waivers and the injection of substantial aid into the region as a necessary but not sufficient precondition for changing attitudes.

The role of poor planning by urban-based bureaucrats who have little feel for the environmental consequences of their decisions can hardly be disputed. Government and donor projects introduced in the dry Narok, Marsabit and Baringo districts of Kenya to boost mixed farming, for example, floundered because they failed to take into consideration local conditions and culture. As a result, they only served to apply greater pressure on land that had little capacity to carry the kind of development envisaged.

If poor peasants are to be persuaded to become more productive and able to take environmental conservation seriously, suggests Karugu, there must be government support to smallholder food production in the form of subsidies — and subsidies are anathema to SAPs. Larger farmers who earn well are more likely to benefit from SAPs as well as engage in environmental protection because they have the means and resources and they recognize that it is to their advantage in the short and long term.

Lucy Oriang in Kenya



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BEYOND DEVELOPMENT COOPERATION Toward a new era of global and human security

by Fauzya Moore

Profound changes have occurred during the past few years, from reduced military needs to economic restructuring and social unrest. For Canadians, both domestic and international changes have driven home the message that we are more vulnerable and dependent on external factors. In other regions of the world, inequitable and inadequate access to resources and a lack of representation in national and international forms of governance have been long-term realities.

If development assistance is to make an impact, it too must evolve to reflect the changes of the past decade.

Beyond Development Cooperation documents proceedings of an international conference of the same name. Hosted by the Society for International Development in October 1993, it calls for renewed thinking on development cooperation.

IDRC 1994, 8 1/2 x 11, 60 pp.,
0-88936-714-0, CA \$16.95

THE UNIVERSITY AS AN INSTITUTION TODAY

Topics for reflection

by Alfonso Borrero Cabal

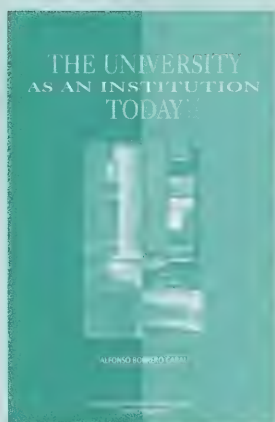
After 40 years of rapid expansion, institutions of higher education worldwide are facing major financial constraints.

In *The University as an Institution Today*, author Alfonso Borrero Cabal argues that the university administration must reflect a specific goal and vision for the institution.

Borrero Cabal traces the origins of the university concept to its current state and examines the university's philosophy as an institution; its structures; and its service to culture and the professions.

The University as an Institution Today is an all-encompassing study of universities, setting guidelines for assessing the efficiency of the university's institutional structure.

IDRC and Unesco 1994, 263 pp.,
5 3/4 x 8 3/4, 0-88936-685-3, CA \$24.00
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MEASURING THE IMPACT OF INFORMATION ON DEVELOPMENT

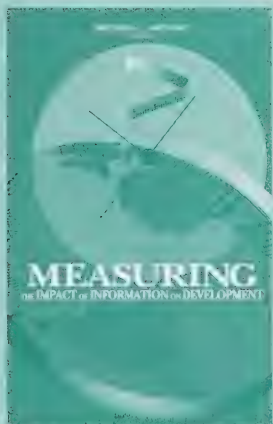
edited by Michel J. Menou

With shrinking dollars available for collecting and managing information, particularly in the developing world, there is increasing pressure to prove the value of information investments. But how do we do this?

Key information specialists from around the world analyzed this issue — through-to-face discussion and the first-ever international computer conference on the subject.

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THIRSTY CITIES

Urban Environments and Water Supply in Latin America



THIRSTY CITIES

Urban environments and water supply in Latin America

by Danilo J. Anton

In *Thirsty Cities*, author Danilo J. Anton examines the water situation in a selection of Latin America cities, focusing on several aspects — dependence on surface water, groundwater contamination, the inadequacies of distribution systems, and the policies governing water usage. Through various examples, Anton demonstrates that solutions must address environmental, demographic, legal, political, and behavioural issues.

Thirsty Cities shows that equitable and sustainable water systems can only be created when all issues of urban development have been taken into account.

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ENERGY RESEARCH IN DEVELOPING COUNTRIES

edited by Stephen Graham

During the past few years, the topic of energy has been heating up. Today, pollution and excessive energy use are primarily responsible for many of our environmental problems.

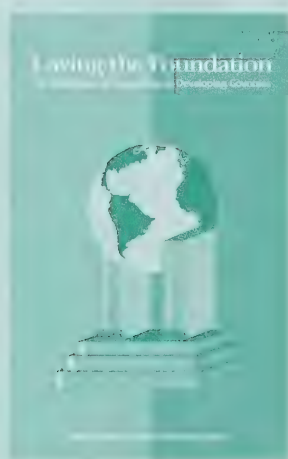
Energy Research in Developing Countries summarizes the 14-volume Energy Research Group (ERG) series, which is copublished by IDRC, United Nations University, and Wiley Eastern, India.

Energy Research in Developing Countries helps readers to better understand the wide range of energy sources and uses, particularly from the perspective of the developing world. It includes enough detail to enable readers to identify options and make comparisons.

IDRC 1994, 300 pp., 5 3/4 x 8 3/4,

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LAYING THE FOUNDATION

The institutions of knowledge in developing countries

edited by Benjamín Álvarez and Hernando Gómez

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Laying the Foundation focuses on case studies of research institutions in the South; but its message is relevant throughout the world.

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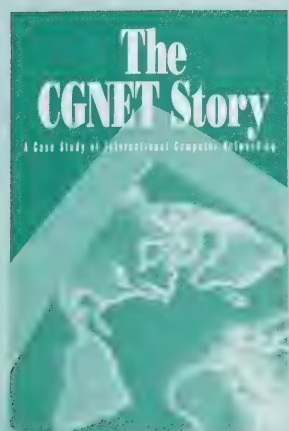
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THE CGNET STORY A case study of international computer networking

by Georg Lindsey, Ken Novak, Selçuk Ozgediz, and
David Balson

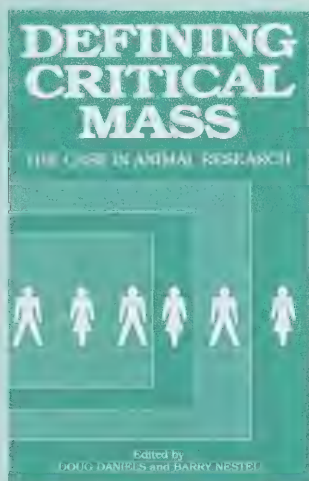
When it was first created in the 1980s, CGNET — the computer-based communication network of the Consultative Group on International Agricultural Research — was a ground-breaking achievement.

Using a case-study format, the authors combine their collective experience to describe the development of the CGNET communication network and related technology. *The CGNET Story* shows the power of electronic communication and provides a comprehensive account of how it can be established internationally.

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DEFINING CRITICAL MASS The case in animal research

edited by Doug Daniels and Barry Nestel

Many existing research programs may be too small to produce useful results. This is the conclusion suggested by livestock and information specialists who met in Costa Rica to discuss critical mass — the minimum level of resources needed for effective research activities. *Defining Critical Mass* is the record of that event and provides the first systematic investigation to identify resource requirements in animal research.

Editors Doug Daniels and Barry Nestel present comprehensive guidelines for establishing the minimum resource levels required to successfully undertake animal research programs.

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THE END OF A MILITARY CENTURY?

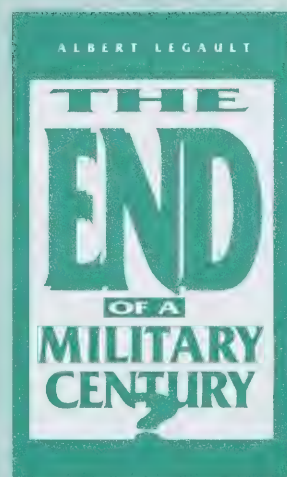
by Albert Legault

In *The End of a Military Century?*, Albert Legault challenges the acceptance of war as a legitimate expression of conflict and advocates global responsibility to increase the chances of survival for our planet. He breaks new ground by blending various schools of thought to propose a triadic model of international relations: "peace by might," "peace by right," and a "transsystemic" model that calls for development in harmony with nature.

Using empirical data, the author reveals the economic consequences of war and gives a new direction to the ethical debate as it sheds light on the changing relationship between science and society.

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Transport policy in the cities of Brazil

by Alan Douglas Poole, Marcus C. Melo, and Regina S.V.M. Pacheco

Moving People is the first English-language book to address the increasingly important problems associated with urban passenger transport in Latin America. The authors concentrate on Brazilian cities but explore environmental and financial issues that are of growing concern throughout the world.

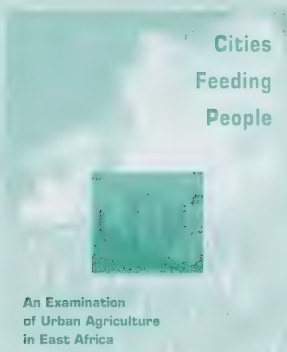
The book reviews various elements that must be considered when designing appropriate policy for passenger transportation, including demand, congestion, socioeconomic equity, environmental and energy impacts, pricing, and finance. It also focuses on the importance of modal choice, system integration, regulation, and ownership.

Moving People is an excellent reference tool for urban transport planners and for people interested in the energy and environmental impacts of urban transport policy.

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edited by David Nostbakken and Charles Morrow

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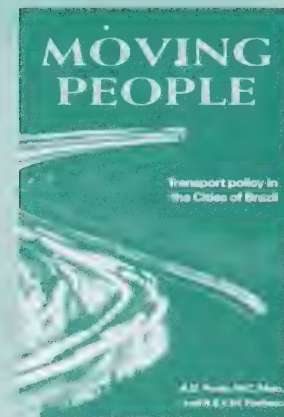
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CITIES FEEDING PEOPLE

An examination of urban agriculture in East Africa

by Axumite G. Egziabher,
Diana Lee-Smith, Daniel G. Maxwell,
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For the urban poor of the South, food is becoming a prohibitively expensive commodity. Urban agriculture, it is argued, can help to solve this problem. But most Southern governments do not support it.

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RESADOC: THE SAHEL MEMORY BASE

The Sahel Documentation Network, RESADOC, is now fifteen years old. This is long enough to draw some lessons from experience and to assess the contribution the organization has made to scientific and technical knowledge of the Sahel. The objective pursued by the network is to provide better access to such resources and to use them effectively to find solutions to the region's development problems.

What are the points of reference that might allow us today to understand the importance of this documentation network, its accomplishments and its limitations? How can we appreciate its evolution in light of the recent changes within ICDSC, the Permanent Interstate Committee for Drought Control in the Sahel?

The ICDSC, created in September 1973, is an organization for regional cooperation made up of Burkina Faso, Cape Verde, Gambia, Guinea-Bissau, Mali, Mauritania, Niger, Senegal and Chad. As early as the 1970s, the ICDSC and the Club du Sahel were already stressing the inadequacy of both the available studies and the capacity to develop programs, given the objectives to be pursued. This, it was said, was one of the factors inhibiting any large-scale action to promote development in the Sahel.

The two partners suggested then that the Sahel should equip itself with its own "memory base of studies," that would consist of a database where the record of such work would be kept. It was in this context, in 1976, that IDRC asked consultants to propose a regional structure that would translate into fact the initial proposal for creating a "Sahel memory base." The idea of a Sahelian Scientific and Technical Information and Documentation Network (RESADOC) was adopted at that time, to be coordinated by the Sahel Institute, that would link up national, regional and international documentation services. When it was created in October 1977 the Institute, which was

IDRC: Neill McKee



RESADOC permits the collection and exchange of research on development problems in the Sahel such as desertification.

attached to the ICDSC, was given the task of improving the gathering, processing and exchange of information on development in the countries of the Sahel. This was the beginning of one of the first experiments in documentation in Sub-Saharan Africa. It immediately evoked a real interest both in the Sahel and among the first donors: IDRC and certain American, German and French organizations. Over the years, other organizations have also lent their support to the network.

THE CHALLENGE: NINE COUNTRIES, ONE NETWORK

In creating a network instead of a centralized system, the founders of RESADOC were launching themselves on a difficult course. At the beginning, documentary management in Sahel countries was of uneven quality, and most of them did not have an adequate infrastructure. There were few professionals specialized in documentary techniques; information processing and storage systems were for the most part manual; a few rare computerized systems existed, mainly for application in producing bibliographic indexes. This lack of consistency was worsened by the lack, especially at the national level, of any coordination of existing documentation systems. In such circumstances, the first thing to

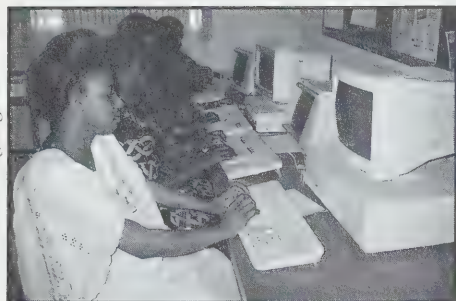
be done was to harmonize the processing of information and strengthen the capacities of personnel in the participating centres. These actions led to the creation, or strengthening, of information handling capabilities in most of the countries. In the current economic context, RESADOC can take pride in having developed Sahelian "awareness" of documentation, as illustrated by the remarkable efforts made by various countries, without any outside help, to develop their own minimum organizational infrastructures for improving their situation with regard to scientific and technical information.

These efforts allowed RESADOC to consolidate its components, whether regional (Coordination Centre of the Sahel Institute in Bamako, in Mali, and participating centres belonging to specialized regional or sub-regional agencies), national (in each country, a national centre is linked to sectoral centres) or international (cooperation with documentation systems and centres outside the Sahel). One result of this cooperation is the common database, which is one of the richest sources of information on development in the Sahel. Furthermore, RESADOC cooperates with the specialized networks on agro-forestry and drought resistance.

POSSIBILITIES AND LIMITATIONS

Use of the common database has made it possible to produce several bibliographies, general or selective, often aimed at technicians in the field. This bibliographic activity, however useful it may be, still has its limitations. These are, first of all, in terms of logistics: it is difficult to get the documents; the material for using microfilm is inadequate, if it exists at all; telematic links between the centres are poor. There are also technical limitations: the products are often poorly adapted to the various categories of users, and staff are not trained in non-documentary approaches. The potential of RESADOC is thus far from being fully utilized.

There is no doubt that the greater part of the success achieved by RESADOC since its creation lies in the structuring and functioning of the net-



IDRC: Robert Bourgoing

A shared data base has allowed RESADOC to produce numerous bibliographies for the use of field technicians, among others.

work. We must admit however that these are still precarious, given the lack of clearly understood rules to be observed by the responsible parties — there is no such thing as coordination among national participants. Participation in the network still depends largely on the good will of the national correspondents, who are for the most part without any political or even institutional support. The lack of financing is often cited as a reason for the lack of action by one network or another. The lack of funds, however, cannot explain nor justify all the deficiencies that have been noted.

FINANCIAL RESOURCES

No one can deny however that permanent financing sources must be found. For the last fifteen years, most of the network's activities have been financed by donor agencies. This extreme financial dependence of RESADOC poses problems, whether for its functioning, for its staff salaries or for replacing essential equipment in a sector where technological evolution is among the most rapid anywhere. This financial dependency is becoming critical, now that the ICDSC has chosen to reduce its operational obligations and rationalize its programs. The RESADOC coordination centre has been forced to lay off part of its staff.

In this setting, is it reasonable to expect that RESADOC can remain viable without massive and continuing support from external financing sources? Will the network be able to generate or mobilize other types of resources that might allow it to maintain itself and to adapt to structural and technological changes?

It would be unrealistic to expect complete self-financing when one real-

izes that even in developed countries, information systems still rely heavily on public subsidies or on help from institutions. Nor is there any use in trying to attract external support to ensure the survival of RESADOC without taking the necessary steps to adapt to current technological change (telematics, new electronic supports). These are going to have an influence on the network's structure and the ways it operates. In short, RESADOC's capacity to generate revenue will depend on a more effective institutional framework.

It is also important to note that the future of library services cannot be isolated from that of other data systems (factual, statistical, etc.) that are being developed in other areas of the ICDSC. It would be desirable furthermore if the Committee could plan for better coordination of its information systems, to demonstrate their complementarity thanks to the development of integrated knowledge databases. This is what it will take if the scientific and technical information accumulated by ICDSC is to be put to better use for the development of the Sahel and the battle against desertification.

Given both its potential and its history, RESADOC should play a leading role in the information policy of the ICDSC.

ALIOUNE B. CAMARA, Program Administrator, Information Systems and Science, IDRC, Dakar.



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AN OVERVIEW OF RESADOC

Objectives — Gathering of scientific and technical documentation; supplying information to users; access to external information sources and transfer of information technology; encouragement of documentation; inter-state cooperation; personnel training; establishment of a bibliographic database; support to ICDSC member states in defining and applying documentation policies.

Structure — A regional coordination centre based at the Sahel Institute in Bamako, in Mali; national networks in each of the nine member countries of ICDSC, organized around a national correspondent centre and documentation centres and specialized libraries; documentation centres in regional agencies; partners beyond the Sahel.

Areas Covered — Development of ICDSC member countries in various sectors (according to the RESADOC codes): plant production; protection of crops and harvests; animal husbandry and production; fisheries; forestry; ecology; transportation / telecommunications; marketing / prices / stockpiles; food security; human resources (employment, training, extension services); rural sociology and economics; industry; planning / economic policy / international cooperation; science policy / research / methodology; information / documentation.

Documentation Resources — As of July 31, 1991, the Regional Coordination Centre had at its disposal : a documentation base of 10,400 units (monographs, reports etc.); a microfilm bank of 12,000 units; a database with 20,000 references; a series of specialized data bases produced by external partners.

Reference: RESINDEX and Aw, S., "The Sahel network for documentation and for scientific and technical information (RESADOC)," L'Ecluse, vol. 4, N° 2, 1992.

Samir Amin

VIEWPOINT is a new feature offering IDRC Reports readers the ideas, analysis and opinions of specialists on important issues facing international development and research.

SAMIR AMIN ON DESERTIFICATION

Desertification has long been defined as a form of destruction of soils, deforestation etc., occurring independent of climatic phenomena (drought, wind erosion, effects of water). Samir Amin, Director of the Third World Forum, insists on the fundamental link between desertification and land holding systems as they relate to international trade in cash crops, which was the topic of a workshop sponsored by IDRC in Nairobi in May 1994.

Reports: Can we consider cash-crop monoculture, for example peanuts in Senegal, partly responsible for the phenomenon of desertification?

Samir Amin: In Africa, traditional land holding systems were collective property systems that were managed by authority of the village. In the Sahel, until the end of the 19th century, this kind of system functioned so as to maintain an ecological equilibrium, a balance based on a scattered rural population with vast lands and forests. It was quite rational to exploit these through land fallowing, pasturing and wood cutting. Until the colonists arrived, these relationships were generally protected, in particular the pairing of demography/land, agriculture/livestock rearing. Once colonization occurred, world capitalism suppressed the powers of village authorities as well as the community's management of land and natural resources. Collective property was stripped of its meaning.

The shift to quasi-individual property occurred in parallel with new forms of commercial agriculture, known as cash

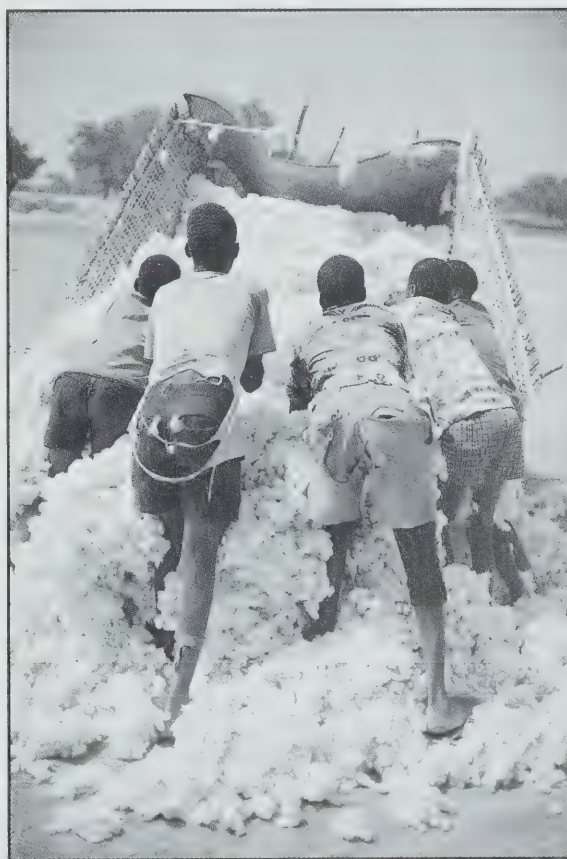
crops: coffee and cocoa in the Ivory Coast, peanuts in Senegal. In the latter country, peanut monoculture began more than a century ago. It spread over the entire central and north-western part of Senegal, and made the country one of the world's major exporters of peanuts.

Reports: Given the growth of competition that international trade has generated, we see that the majority of African governments seem to still be favouring cash crops in order to earn more income from exports. Is this happening at the expense of growing food crops?

Amin: Look at what has happened in Senegal. Today we find that the soil has been depleted in all these lands of the north and centre that are commonly called the "peanut belt." The fields there have become less and less

productive. Climatic phenomena such as the drought cycles of the last two decades have made the desertification process worse. As a consequence, the vegetation cover has been increasingly degraded, there has been overgrazing. Elsewhere, in the Ivory Coast for instance, forest cutting permits issued to colonists have led to abuse. In the Sahel, there is the whole problem of cutting wood for charcoal.

Demographic growth has also weakened the ecological balance in this sense. It is in the context of this relationship that we see the impact of landholding management and international trade on desertification. This is because, in contrast to European farmers who incorporate in their farm prices the costs of maintaining and renewing their soil (fertilizers, crop rotation), experience shows



IDRC: Stephanie Colvey

Cotton for export, Benin.

that the African farmer finds it difficult to improve and maintain land that does not belong to him. Yet, according to the market ideology that makes supply and demand the absolute criteria of rationality, it is this absence of land rents that explains why the world capitalist system can pay such low prices for agricultural products such as coffee, cocoa, peanuts, and cotton.

The prices that the producer receives have become less and less profitable, and have never been enough to allow the upkeep of land capital. Hence the destruction of this capital. This is certainly the case in Senegal with peanuts, and in Niger and Mali with regard to the effects of overgrazing.

But since the world marketplace has a certain preference for these basic export products, the farmer is driven to cultivate the minimum of food crops and the maximum of cash crops, in order to earn more income — even though this destroys the soil still further.

These phenomena surrounding desertification, even if they are not specific to Africa (Karl Marx noted them in northern India as a result of English colonization), are all the more tragic in our time.

Reports: And yet, after the cycles of drought that have afflicted the continent, the last one being in southern Africa in 1992, are people not now saying that the battle against desertification must involve diversification of crops and a strengthening of the synergies between agriculture, livestock and silviculture?

Amin: Whether we are talking about so-called cash crops (peanuts, cotton, tea, coffee, cocoa) or food crops (millet, sorghum, rice, maize, etc), any monoculture is going to create imbalances in the environment and weaken the ecology. This is why we have to find a land management system that is capable of maintaining equilibrium: forest-grazing equilibrium, equilibrium between use of the forests and developing the land, farming-grazing equilibrium.

Reports: Yet this does not seem to take account of the structural adjustment policies that have virtually strangled African agriculture.

Amin: In their rural development policies, African countries have often been led to create administrative

IDRC: Stephanie Colvrey



Dantopka Market, Cotonou, Benin. Samir Amin believes that greater reliance on internal markets is part of the solution to Africa's agricultural crisis.

services that favour the farming community, for example, agricultural product purchasing agencies. Structural adjustment policies, which are characterized mainly by privatization and the withdrawal of the State behind these administrative agencies, have launched a frontal attack on integrated rural development policies, and farmers today are left alone to face the laws of the international marketplace. This makes their problems still more severe, at a

time when some European prices for agricultural products that are widely consumed in Africa, such as wheat or rice, are subsidized for export.

Reports: In the longer run, then, won't the battle against desertification mean redefining development?

Amin: Yes. Among other things, the prices for tropical agricultural products are going to have to become more profitable. But in addition, the land is going to have to become the real property of the farmers before they can incorporate the maintenance of their landed capital into their production costs.

The devaluation of the CFA franc (African Financial Community franc) with respect to the French franc has doubled the price for tropical products, it is true. Yet farmers of the 16 member countries of the UEMOA (West African Economic and Monetary Union) have not seen the end of their troubles. The prices of inputs (fertilizers, pesticides, etc.) that are imported are going to double in due course; and the positive short-term effects of the devaluation could well be wiped out.

In short, if the continent is to escape from its agricultural crisis, we need a new sustainable development policy:

- get out of specializing in tropical products for export.
- give priority to internal African markets.
- and finally, build complementary farm production systems across the continent.

Madieng Seck, correspondent for Agence Péricoop in Senegal.

SUSTAINING A LATIN AMERICAN WETLAND

The Pantanal is a huge, swampy wetland that forms the heart of South America, spreading across much of south-western Brazil and into Bolivia and Paraguay. This productive ecosystem — covered by water during the torrential rainy season and transformed into grasslands with watering holes and marshes in summer — has the greatest concentration of wildlife on the continent.

Hérons, egrets and other exotic wading birds feed on piranha and a multitude of other fish; rare hyacinth macaws eat palm nuts in the trees; jaguars stalk howler monkeys in the forests.

Until recently, the Pantanal, one of the world's largest wetlands, larger than countries such as North Korea or Greece, was a virtually unspoiled paradise. Its delicate ecosystem was protected by its remote location, and its natural resources exploited and man-

aged by the rural people who for centuries earned a subsistence living from fishing and low-density cattle raising.

But like other Brazilian wetland areas, particularly the river floodplains and mangrove areas on Brazil's northeast coast, the Pantanal and its traditional way of life is threatened by overexploitation and modernization.

An IDRC-sponsored project on traditional and modern wetland resource management aims to help local people in the Pantanal, as well as in coastal northeastern Brazil, to curb harmful wetlands development. The project will provide them with a plan of action by gathering information that can help them oppose projects that are destroying their homes and livelihoods, negotiate alternative, sustainable ways of exploiting natural resources that will also improve their standards of living, and let them take part in managing sensitive wetland areas.

To do this, researchers will compare the benefits of traditional resource management in the wetlands with current or proposed plans to develop the areas. The project will combine the

valuable indigenous knowledge of residents with modern science to provide local people with new ideas to replace damaging developments in their regions, as well as adapt traditional approaches to new realities.

"We want to get information about these small local communities and try to understand how they live, how they exploit natural resources, and the impact of modern projects on traditional ways of life," says Andre de Castro Cotti Moreira, project co-leader, from the University of Sao Paulo's Centre for Research on Human Population and Wetlands in Brazil (NUPAUB). "We're looking at the real consequences, social and environmental, of the main modern threats in our study areas," Moreira adds.

From there, the project's final objective, he says, is to show what improvements can be made on traditional ways of exploiting natural resources by adding modern aspects, while minimizing negative effects on the way of life and biodiversity of the regions.



Subsistence fishing faces threats from a variety of mining and industrial pollutants as well as recreational fishing.

IDRC: Denis Marchand

RESCUING VALUABLE KNOWLEDGE

"We're not trying to go back to the past, and return the local communities to the way they were before," Moreira explains. "But we are trying to rescue some valuable knowledge they have and adapt it to the modern situation. This gives them protection against these modern projects, which are causing lots of environmental and therefore social impacts in their communities."

The project is large, encompassing research sites in the Northern Pantanal in the state of Mato Grosso, as well as northeastern coastal areas of the Marituba floodplain in Alagoas and Sergipe states, and the Mamanguape mangrove in Paraíba. Multidisciplinary teams of researchers from the federal universities, including anthropologists, biologists, sociologists, ecologists, agronomists and geographers are conducting the research in their areas. NUPAUB in Sao Paulo coordinates the project.

Although these wetland areas all face unchecked development, resulting in social and environmental dislocation, each area has its own distinct problems. In the Northern Pantanal, where the research is focused on two sites, one on the Cuiaba and one on the Pocone River, rice and soybean farmers on the plateaus surrounding the Pantanal are using fertilizers and chemicals, polluting the soil and water. Miners are dumping mercury, used in the extraction of gold. And industrial plants that extract biomass alcohol from sugar cane, used in motor vehicles since the 1970s in Brazil, generate with each litre of alcohol 13 litres of a toxic byproduct called vinhoto, which is also dumped into the rivers. All these contaminants are not only killing huge numbers of fish, but along with them the traditional way of life for many Pantaneiros.

Planned hydroelectric power dams, tourism, deforestation, road construction and wildlife poaching have all helped intensify problems in the region in recent years. And most disruptive to the traditional way of life, subsistence fishing and agriculture are being replaced by commercial fishing and agriculture, while low-density cat-

tle ranching, the area's main traditional economic activity, has become a problem due to poor pasture management and commercialization.

"With cattle, the main threat is an alteration of the flooding regime caused by drainage for grazing pastures or road construction by big ranchers, which modifies the water cycles," confirms Moreira. And fishing is threatened too, he adds. "Pollution of the Pantanal, along with alterations in fishing activities — recreational fishing with nets, for instance — are causing problems with the fish stocks and problems for the local communities who live mainly or solely on fishing."

Wetlands: Threatened Nature Subsidy

Throughout history, wetlands have been providing people with a wide range of resources and services, free of charge. They regulate floods, treat effluents, stabilize coastlines and buffer raging storms. In Brazil's Marituba Wetland, the Marituba study group are at last quantifying the human face of its resources, aided by villagers. They have found that some 56 animal species — named by local people — are used to make about 120 folk medicinal products. These find use in the villages and towns of the lower San Francisco River to cure 25 different diseases or health disorders. Over 300 botanical species have been identified by the villagers so far as serving multiple purposes: medicinal; fisheries; cultural uses such as magic, crafts, and construction; fruit-bearing; veterinarian; and as bioindicators of seasonal change, weather and soil quality.

The local people try not to overuse these resources. Fishermen explain that when yields decline at one fishing ground they rotate to other sectors of the complex until that "tired" ground recovers.

Unfortunately, an estimated half of the world's wetland ecosystems have already been destroyed, according to Dr. Antonio Carlos Diegues of NUPAUB. Part of the problem is that by their very nature wetlands are dynamic ecosystems and thus are difficult to outline on airborne images and maps. As the interface between land and water, wetlands are usually viewed by developers both in the North and South as a swampy hell obstructing human progress, despite growing worldwide evidence that wetlands are the engines of life in the larger river systems of which they form vital parts. Misguided development undermines the flood pulse, the driving force behind wetlands' teeming life. When resources themselves are not plundered or water bodies polluted, river damming, diversion, channelling, drainage and landfilling destroy habitats, fauna and flora, dependent livelihoods and services to larger human settlements.

Following up on initial efforts by the World Conservation Union and the Ford Foundation, IDRC now supports wetland research on the Pantanal, the coastal complexes of northeastern Brazil, the floodforests of the western Amazonia and the floodlakes of the eastern Amazonia, and the coastal Laguna Merin complex on the Uruguay-Brazil border.

Luc Mougeot, Environment and Natural Resources, IDRC

The main objective of the project in this region is to study how the people of the Pantanal are adapting to the changes, and how their traditional way of living is being affected. More specifically, the research focuses on the traditional use of natural resources in both the flooding and dry period; how people have made a living; changes to the ecosystem caused by new economic activities such as gold mining, large-scale agriculture and cattle ranching, especially on the small-scale fisheries that were the basis of living for many; and alternative ways for the population to make a living in the changing environment.



Cattle ranching in the Pantanal creates problems related to poor pasture management and changes to water cycles.

SUGAR CANE THREAT

In the northeastern study sites, the threats are less diverse, but current disruption is just as serious for the viability of the wetlands and the livelihoods of their inhabitants.

In the Mamanguape mangrove and estuary in Paraíba state, the main danger to the area and traditional life is sugar cane. Plantations have been encroaching on more and more land, including estuaries and mangroves. "These areas are commonly used by traditional communities who gather wood, fish, crabs and oysters. Now with the advancement of sugar cane alcohol distilleries, there have been many negative impacts on the area, and community," says Moreira. One is pollution from vinhoto and another is widespread use of pesticides.

Both vinhoto and pesticides are contaminating rich crab harvesting and fishing grounds of the Mamanguape mangrove, one of the last natural habitats of the ocean manatee. Many residents have been forced by the dearth of fish into labouring on the sugar cane plantations.

On the Marituba floodplain, in Alagoas and Sergipe States at the mouth of the San Francisco River, the sugar cane threat comes second to that posed by rice plantations. A government project to drain the entire floodplain would "transform the biological and geological factors sustaining the area," says Moreira. Already, the drainage of some areas by the agency has diverted water flow and obstructed fish migration.

As well as studying the traditional ways of the local community, project researchers evaluated an environmental assessment study commissioned by

CODEVAP, the state development agency that is implementing the rice plantation projects, about the effects they would have on the region.

"One of the arguments for the project was that it would bring social benefits to local inhabitants because they would be used as workers. But we thought the environmental assessment study was weak, so we evaluated it by gathering our own information about natural characteristics of the region and how the people there live," says Moreira. "We found that this and similar projects don't bring any economic benefit to the population, plus they cause a lot of environmental problems."

The new findings have been used as a weapon for the poor local people against harmful rice plantation development. The plan would change the whole flooding regime, cause alterations in the main fish species and reduce biodiversity, which would adversely affect the population and its livelihood from fishing. The former project coordinator in the region created an NGO to protect the region, and it has been successful in slowing the rice plantation's implementation.

"Ultimately we probably won't be able to stop it, but at least we can slow it down and modify it," says Moreira of the efforts of the NGO and the project researchers working in the area.

REALISTIC COMPARISON

Taking the three sites together, the project will yield the necessary information to compare the economic productivity of traditional activities versus modern activities in each region. The comparison will serve as a counterargument to predatory developments. "We will compare sugar cane, rice,

cattle raising in the extensive way now common in Pantanal region, with traditional ways of doing things. We will then be able to make a more realistic comparison of the productivity of the two ways of exploiting the environment."

The project could also result in protected areas being created to be managed by local groups. It will analyze the possibility of extractive reserves for the wetlands, based on the model of the rubber tappers's reserve in Amazonia, where resources are controlled by the community.

Says Moreira: "We want to see if it would be possible to adapt the concept of an extractive reserve to these wetland areas, integrating all the activities including gathering crabs, oysters and wood, fishing, and steer culture in the Pantanal. Local communities could care for the areas themselves, without being worried about the impacts of outside projects. They would have the right to protect and administer their wetlands using sustainable exploitative strategies for the natural resources."

Moreira says the project has already taken steps in this direction. In the Pantanal, for example, fishermen are already protecting the area by ensuring that tourists fish using traditional methods and without motorboats. "There is currently an unofficial fishing reserve at our research site, but we are trying to elaborate this idea of letting the fishermen manage their area and present it to the state government. We hope it could become a solid institution."

In addition to being of direct benefit to the local wetland communities, the findings will benefit governmental and non-governmental agencies in developing programs for sustainable use and conservation of the study areas. There are also possibilities that findings could be applied to wetlands with similar conditions and problems in other countries.

Kirsteen MacLeod in Brazil



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SOUTH AFRICA: SCIENCE AND TECHNOLOGY FOR ALL

In South Africa, scientists have developed an automated check-out system for supermarkets in which the shopping cart is pushed into a device that picks up and rings in each item with no human effort.

Yet the same country has three million households, 19,000 schools and 17,000 health clinics — located mostly in black communities — that have no electricity, according to a socio-economic policy framework drawn up by the African National Congress (ANC) and the democratic movement in 1993.

This kind of disparity has long characterized South Africa's science and technology infrastructure, geared traditionally to safeguarding white minority privilege and ignoring the real development needs of the black majority.

But in a process that began in 1992 with an IDRC-sponsored Mission to review science and technology policy in South Africa, the ANC, the democratic movement and members of the country's research community have undertaken the massive task of reorienting science and technology to improve living conditions for the impoverished black majority. How to approach this transformation was the object of an ambitious series of consultations known as the Science and Technology Initiative.

There is general agreement that making science serve all South Africans presents a daunting task in a country recognized as having the world's most unequal income distribution along racial and class lines.

Consider some figures supplied by the ANC and the Congress of South African Trade Unions (COSATU):

- 5% of white South Africans own 88% of the country's wealth. On average, whites earn 10 times more than blacks.
- Some 12 million black South Africans have no access to clean drinking water.
- Under apartheid policy, 13 hospitals (primarily to serve whites) in

7 cities received 47% of government health expenditures.

- The backlog in housing for blacks is estimated at between one and a half and three million units per year, increasing at a rate of 200,000 annually.

Frene Ginwala, a senior ANC official working on the Science and Technology Initiative (recently appointed to the new South African cabinet), says that "if the government is to build houses, supply water, improve the education system, we need to start looking at the science and technology system, reorganizing the structures so that they can feed into the process."

Jayendra Naidoo, Secretary General of COSATU and one of the Science and Technology Initiative's co-chairs (recently appointed to the new South African cabinet), speaks of the need to solve the country's development problems by tapping into existing expertise in South Africa. He describes the Initiative as "healthy engagement," attributing its creation and success so far to the groundwork of the IDRC-sponsored Mission. Commissioned by the ANC, COSATU and the South African National Civics Organization (SANCO), the Mission used a methodology normally applied to reviewing

science and technology policy in industrialized countries.

In South Africa, the Mission interviewed officials who manage the country's key science and technology institutions, and consulted bureaucrats, policy-makers, scientists, academics, researchers, business representatives and educators. The findings were published in 1993.

HOLDING UP A MIRROR

James Mullin, the Mission's leader, stresses that the objective was "to hold up a mirror and reflect what those involved in science and technology in South Africa shared with us." He adds that although the Mission was initially apprehensive about the former white minority government's reaction, in the end members were "surprised and pleased by the openness of the participants."

What the Mission found was a science and technology infrastructure burdened with the legacy of apartheid and bureaucratic rivalries. There was no effective forum to discuss policy and secrecy around decision-making prevented public consultation on policy matters.

Mission member Geoffrey Oldham describes the country's science and technology infrastructure as "a first world system being used to tackle first world problems." In his view, institutional contributions to improving living conditions for the black majority are "minimal compared to the needs."

The Mission reported that South Africa has focused disproportionately on technological development for state security, defence and nuclear power capacity to preserve the white minority's status, thereby disregarding economic progress and social equality.

According to the Mission report, South African science and technology institutions are now re-defining their priorities to address the needs of the black majority because of three main factors: pressure within the country for democracy and social equality, the need to participate in the rapid globalization of technological development, and the adverse effects of the global recession. The Mission observed weak leadership in science and technology



IDRC: Deborah Carter

Science and technology development in South Africa must redress years of underinvestment in meeting housing and other essential needs.

policy at the national level, worsened by years of disinvestment in research and development and a funding freeze to institutions. And international sanctions kept many technological advances away from South African scientists.

Compounding these problems is an education system in crisis, especially in the area of mathematics, science and engineering. According to Mullin, only one in 10,000 black children will graduate with qualifications in science and technology.

MAKING INSTITUTIONS RESPONSIVE

In order to address the glaring disparities, the Mission report emphasized the need for community groups and science and technology institutions to work in partnership to identify and meet the needs of the black majority. To achieve this, the report called for the management of these institutions to become non-racist, non-sexist, and to implement affirmative action programs to ensure that staff members reflect the needs of the groups each institution serves. Finally, the Mission recommended that South Africa's new government make strategic, long-term planning and research a national priority.

The Science and Technology Initiative takes up where the Mission left off. At the behest of the ANC, consultations involving South Africa's science councils, government ministries, parastatal agencies and industries were held to review the Mission's report, identify priority areas, and begin working on solutions.

After a year in operation, the Initiative's main priorities are sharing information on South Africa's existing science and technology system, encouraging openness in decision-making, advising, and helping shape the post-apartheid science and technology infrastructure. It also emphasizes human resource development and responsible governance in science and technology institutions as well as aiding these institutions to respond to major issues.

Brian Clark, President of South Africa's Council for Scientific and Industrial Research (CSIR) and the Initiative's other co-chair, emphasizes

BUILDING A DEMOCRATIC FUTURE

In early 1994, senior members of the ANC and Democratic Movement offered their insights on a post-apartheid South Africa at an IDRC-sponsored media briefing in Montreal, Canada. According to Cheryl Carolus, a member of the ANC's National Executive Committee and National Working Committee, "the ANC is carrying with it into Parliament the hopes, aspirations and expectations of black South Africans."

In order to address these expectations, the ANC and the Democratic Movement developed the Reconstruction and Development Programme (RDP), an integrated socioeconomic policy framework that seeks to mobilize South Africans and their country's resources to build a democratic future.

The RDP focuses on meeting basic needs, developing South Africa's human resources, building the economy, and democratizing the state and society.

The task ahead will not be easy. South Africa continues to be plagued by poverty, high unemployment, violence caused by political and socioeconomic factors, and an unequal distribution of wealth along race and class lines. Social problems such as racial and ethnic tensions, gender discrimination, widespread violence against women, and deep-seated frustration and mistrust constitute major threats to peace and progress. Yet South Africa's leaders are confident that these problems can be overcome. According to Carolus, "we've built up a culture of democracy in which people are actively involved in developing alternatives."

IDRC is assisting in South Africa's transformation by providing support to the democratic movement. In addition to sponsoring four Missions to South Africa — which examined economic analysis and policy formulation, urban policy, science and technology policy, and the environment — IDRC-supported research projects are addressing issues such as the environment, education policy, the training and development of new civil servants, the violence in Natal province, and community health.

that participants are determined to bridge the gap between the social and natural sciences in an effort to solve South Africa's development problems.

"Social scientists can play an important role in the identification of needs and the deployment of technology." According to Clark, a major obstacle is apartheid's legacy of "a total intolerance of difference." He says the response from the CSIR is to conduct programs to teach people how to manage diversity and difference of opinion.

Despite many roadblocks, both Clark and Jayendra Naidoo believe that the consultations have fostered a more consensual culture that involves people and promotes democratic governance at the local, regional and national levels. Naidoo points to discussions on rural road construction taking place between Initiative representatives and the civil engineering industry. They have worked out ways to consult communities about their needs and use local labour instead of sophisticated machinery. Similar committees are examining electrification, housing and telecommunications issues.

The Initiative is also trying to build the black majority's trust in science and technology institutions, which many still view as part of apartheid state machinery. This task may prove difficult. In a country where the first successful heart transplant was performed, thousands of black children die annually of malnutrition and curable diseases such as measles.

Yet, according to Frene Ginwala, there is some confidence that with assistance from those involved in the Science and Technology Initiative the technical skills and expertise needed to address the black majority's development needs can be found within the country. "We have a massive problem of undoing the political, economic and social consequences of apartheid as well as meeting basic needs," says Frene Ginwala. "By mobilizing science and technology for those needs, we're going to succeed."

Deborah Carter



Towards a science and technology policy for a democratic South Africa: Mission report.
IDRC 1993, 131 pp.

THE FISH THAT DID NOT GET AWAY

Although the Yangtze River in China, the Fraser River in Canada, and the Orinoco River in Venezuela are on separate continents thousands of miles apart, they all share a disturbing trait. Vital indigenous fish stocks in all three rivers are threatened by overfishing and habitat destruction.

The massive Three Gorges dam on the Yangtze River will affect the prized Yangtze carp fish stocks. Experts say it is impossible to accurately predict what the dam might do to the river's ecosystem. In Canada, hydro-electric projects such as the Kemano II dam on a tributary of the Fraser pose major risks to salmon stocks. In Venezuela, industrial activity and hydro-electric projects on the Orinoco River also threaten the region's most popular fish species, cachama. On all three river systems the increasing demands of commercial fisheries, indigenous and smaller fishing communities and sport fishers have only exacerbated environmental problems.

"There's ample evidence that major river systems with significant fish stocks are being severely depressed

by overfishing, dams and alteration of habitat," says Brian Harvey, a Canadian fisheries specialist. "There are common threads in rivers around the world."

Researchers fear that the genetic strains and variability of wild fish stocks are being depleted, or at least seriously diminished, at a rapid pace. Some species of fish are near the point of extinction. Harvey points to a study of fish stocks in the Columbia River in the northwestern United States that revealed that 106 stocks of fish are extinct and another 200 are threatened. "No similar study results are available to date on fish species in Colombia, Venezuela, China or Canada," he says. "We can only imagine the results."

PRESERVING GENETIC MATERIAL

To combat this serious threat to biodiversity, biologists and aquaculture specialists are trying to preserve the genetic material of various species through fish gene banks. The establishment of the International Fish Gene Bank (IFGB) in the wake of the UN Conference on Environment and Development in 1992 was a major step toward this goal. The aims of the bank are to preserve genetic material from endangered fish through frozen sperm

and to offer genetic variability to fish hatcheries around the world.

In January 1994, IFGB became a joint venture conservation program of the Vancouver Aquarium. Harvey, the founding director of the gene bank, says collecting and freezing fish sperm in gene banks is crucial for the protection of threatened species. "It is an important kind of insurance policy," he says. "In gene banks, there can be genetic complements for species on the verge of extinction."

Since 1981, Harvey has streamlined techniques for the collection and storage of aquatic genetic material. With IDRC funding he has transformed a cumbersome, time-consuming process into a straightforward, portable technique. Pioneered in Canada, this new method allows biologists to go to remote field locations, collect and freeze material on site, and transport it to permanent gene banks. The gene banking equipment consists of portable freezing and storage containers the size of a small suitcase.

The loss of genetic material in fish species has a particularly harsh effect on fish farms and hatcheries. Already, many hatcheries often rely on too few breeders to reproduce, resulting in lower production, susceptibility to diseases and poor survival rates in the



Netting wild cachama on Venezuela's Orinoco River, where indigenous fish stocks face overfishing and loss of habitat.

wild. As wild fish stocks disappear, it becomes even more difficult for hatcheries to find new breeders.

AGRICULTURAL PARALLELS

Ironically, current trends in fish gene banking mirror reactions to the loss of genetic diversity in field crops and livestock. Perhaps the closest parallel to fish gene banks is that of preserving the genetic material of animals through frozen sperm, Harvey says. "Basically, we're doing the same thing with fish," he says. "Cryopreservation is a fancy term for freezing and preserving the sperm of specific fish stocks."

It is precisely this message of simplicity and awareness that Harvey and IFGB are promoting in Southern countries such as Colombia and Venezuela. The IFGB has focused specifically on the use of the popular cachama fish species along the Orinoco River, which runs through Venezuela and Colombia. Many of the smaller fish farms and hatcheries attempting to breed this fish are constrained by a lack of genetic diversity in the breeders and limited access to wild genetic material. The frequent results from small fish samples, says Harvey, are inbreeding and "genetic drift" — a term used to describe deficiencies in the genetic makeup of certain fish species through narrow breeding techniques.

BUILDING ON INDIGENOUS KNOWLEDGE

Fish gene banks offer vast potential benefits to the hatcheries in South America. Fish farmers have access to better quality fish seed and a greater diversity of wild genetic material. Banked sperm is easier to transport than live fish and avoids transmitting disease. It can also be used immediately or kept indefinitely in liquid nitrogen. "We would like to build on the indigenous knowledge of the people living on the Orinoco and add fish gene banking as an option," Harvey says. "The benefits are there for the smaller hatcheries and fish farmers."

Some key challenges for the IFGB in the two countries include raising farmer awareness of gene banking and demonstrating gene banking technology to potential users. To meet

Portable equipment for collecting, freezing and storing fish sperm can permit later access to a diversity of wild genetic material.



Brian Harvey

these challenges, researchers have established a training program for farmers in techniques for collecting and freezing sperm. The international gene bank has also collaborated with the Instituto Limnológico in Caicara, Venezuela and with the national fisheries arm of the Colombian government to transfer knowledge and equipment. The IFGB also works with the indigenous people of the Shuswap Nation in western Canada on fish gene banks for salmon stocks. The potential for loss of unique fish stocks has become an acute problem for many native Indian communities. "The Shuswap Nation has taken on a leading role in conserving the genetic resources of salmon fish stocks," Harvey says. "They want to use gene banking as a resource tool to ensure the future availability of fish stocks." As in the South American project, local aboriginal fisheries workers will be trained in gene banking procedures, while at the same time accumulating genetic material for targeted fish stocks.

A coordinated network of regional gene banks is planned worldwide. Harvey hopes to see such gene banks in Venezuela, western Canada and China. "This is obviously more than a regional issue," Harvey says. "In rivers around the world — not just Canada, China, Colombia and Venezuela — there exist sharp declines in the genetic resources of major fish stocks."

For Harvey, there is a distinct urgency in the need for fish gene banking. The protection of natural habitat for fish species and the regulation of fishing activity are necessary developments, he says. But he thinks conserving genetic resources has to be the immediate goal. "We have to protect fish habitats, but, more importantly, we need to get samples of genetic material before certain species become extinct," he says. "We can't wait years to clean up the environment and then realize that dozens of fish stocks are gone. By then it's too late."

Craig Harris



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IN THE TANGERINE GROVE

In 10 years as tangerine growers in a province about 40 kilometres north of the Thai capital, Krua Pophan, her husband and their two teenage children have been repeatedly poisoned by the pesticides they use. And through the spraying techniques she employs, Krua has developed a constant case of conjunctivitis, more commonly known as pink eye.

Despite the recurring sickness, Krua said she and other tangerine growers in the region have never been visited by government or pesticide industry officials to be instructed in the safe use of the products essential to their business.

"People only promote pesticides," Krua said in an interview. "They don't care about the illnesses and the deaths. Of course we would like advice. Who wouldn't? There are lots of people getting sick."

Indeed, there are about 7,000 pesticide poisoning cases reported in Thailand each year, said Palarp Sinhaseni, a toxicologist at Chulalongkorn University in Bangkok. About half the cases result from occupational exposure, of which few people die. The remainder are suicidal, which carry a higher death rate, she said.

Tangerine farming, which requires spraying pesticides at head level and above, is consistently in the top five categories of poisoning cases across Thailand, Palarp said. These statistics are just part of the story. Tangerines are widely consumed in the country — without any removal of chemicals — and the crops are sprayed from boats in irrigation canals, leading to frequent contamination of water used by households downstream. For Palarp, these factors make the crop a good choice for an IDRC-sponsored project to devise a training program to educate workers, government officials and pesticide industry personnel on the safe use of chemicals.

The central question in the multi-disciplinary project is why pesticide poisoning is so much more prevalent

in developing countries than in the West, Palarp said. Therefore, the team from Chulalongkorn, including specialists in communications, curriculum development and education, socio-psychology, agricultural extension and toxicology, are trying to address such matters as how exposure can be reduced, why farmers do not follow advice they are given and how well government agriculture workers communicate with tangerine growers.

SAFETY NOT A PRIORITY

Research to this point shows that government agriculture workers in Thailand have typically focused their work with farmers on maximizing crop yields rather than the safe use of pesticides. And, as Krua pointed out, tangerine growers are rarely visited by the authorities. Palarp said the government workers are beginning to realize that overusing chemicals creates pesticide resistance and ultimately reduces crop yield. They are trying to use less, she said.

Project surveys show that the tangerine farmers want to protect themselves against pesticides and reduce their exposure to chemicals but lack the knowledge of how to accomplish that, Palarp said. She cited the example of Krua's children wearing sponge masks for protection while spraying. The devices actually led to poisoning because they soaked up the pesticides, bringing them in greater contact with the teenagers' mouths.

"You have to teach them not just what to do but how to do it," Palarp said. "In order for farmers to practice safe pesticide use, the government



Workers in Thailand's tangerine groves face quite high risks of poisoning from exposure to pesticides.

and industry have to provide them with the necessary tools."

Palarp, the project leader, said the research team is also pushing to limit access in Thailand to highly hazardous insecticides. They do not want the chemicals banned but instead, she said, they want to limit their use to experts wearing protective equipment. Currently, highly toxic pesticides are widely available with no restrictions or government-regulated scheme, Palarp said. "We are lagging behind in our regulations," she said. "But we'll do better. We're accelerating our speed."

While occupational poisoning, which results from mixing, loading, spraying, spilling or contaminating clothes with pesticides, is a main focus of the research team's work, the group is also examining other forms of pesticide contamination.

ENVIRONMENTAL DAMAGE

The other main problems are environmental, Palarp said. After spraying, the chemicals stay in the soil, get into the groundwater and lead to contamination through drinking and bathing, she said. They also damage air quality since the insecticides drift in the wind, Palarp added. Further environmental contamination results when produce grown between rows of sprayed crops absorbs the insecticides, she noted.

Another major research concern is the disposal of pesticide wastes. After spraying, the equipment is washed, spreading chemicals into the irrigation canals and then the water supply. Also, Palarp added, farmers often burn contaminated packaging and equipment, increasing the amount of pesticides in the air. In her view, a more environmentally friendly and affordable solution would be using a 5,000-baht (US\$200) furnace that burns at such a high temperature that all the toxic elements are eliminated.

The sale by farmers of used, contaminated pesticide containers to middlemen who employ people to clean the containers also increases the potential for insecticide poisoning, Palarp said. Under the current Thai system, the cost of pesticide poisoning is paid by the public in the form of contaminated water supplies and foods and the high

number of sick workers, Palarp noted. Multinational companies, which sell millions of dollars a year worth of insecticides, need to be pushed harder to pay for their share of the problem, she said.

TOUGHER LAWS

But ever since a massive chemical fire at a Bangkok port in 1991, the government has been trying to address the problem of hazardous substances, Palarp said. An act was passed putting tighter restrictions on chemicals. Since then both legislators and industry have been paying more attention to the issue, she added. According to Palarp, industry is being forced to pay closer attention to its packaging practices to try to reduce the amount of waste produced.

And in a country where 60 to 70% of its 55 million people are farmers, it is obvious that there is a tremendous need for a program to teach people how to use pesticides safely and provide them with the correct protective equipment.

At present, there are no Thai-specific guidelines for pesticides, so the country refers to those set by the United Nations Food and Agriculture Organization. But tropical countries are more sensitive to pesticide poisoning; for example, the many and varied species of fish, an important protein source for

many people in this region, have been killed in large numbers or otherwise made unfit for human consumption. This consideration makes the need for safe local practices all the more pressing, Palarp said.

Another important aspect of the project, Palarp noted, is to strengthen the system for recording pesticide poisonings. Currently, if a farmer goes into a hospital for sickness, he or she is treated but there is no monitoring of the illness, its circumstances or the chemicals involved. If that data were compiled, authorities would be better able to determine which chemicals are hazardous and develop a program to train government agriculture workers and farmers in their safe use, Palarp said.

While it focuses on one crop in one country, the tangerine pesticide safe use training program, slated to be ready by the end of 1994, will be about 60 to 70% applicable to different forms of agriculture in Thailand and other Southeast Asian countries, Palarp said. "Obviously the agricultural practices would be different in something like rice farming but communications, psychology and the impact of government agricultural workers would likely be very much the same," she said.

Daniel Girard in Thailand



Spraying along canals in tangerine grove. Farmers want to reduce their exposure to harmful chemicals but have lacked knowledge of how to accomplish this goal.



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REPORTS

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CANADA

Health Research that Matters

REPORTS



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Today, all countries of the world face an urgent need to set priorities in the health research they conduct to help improve the well-being of their populations. Nowhere is this need more pressing than in developing countries, which suffer the lion's share of the global burden of illness while possessing a pauper's share of technical, financial and human resources.

IDRC has supported the Essential National Health Research (ENHR) strategy for some four years because it offers an effective and equitable means of setting health research priorities. It also tilts the balance away from strictly biomedical research toward greater emphasis on social and behavioural aspects.

The ENHR strategy requires researchers and policy makers in the health field to bring in a third partner that is too often overlooked: people in local communities. Frequently, people express great concern about vital health issues that can elude epidemiologists and ministries of health. Communities can also lead research to obstacles in other sectors that bear directly on people's health, such as employment, education, housing and agriculture.

The recent establishment of the Council on Research for Health and Development in Geneva represents international recognition of the value of ENHR and the opportunity to involve more countries and institutions in applying this important strategy.

Editor-in-Chief

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Health Research that Matters



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TOWARD EQUITY IN HEALTH RESEARCH

Back in 1986, inequities in health in the face of the rapidly rising costs of health services were not yet major political issues in the South or the North. And the first "Human Development Report," sponsored by the UNDP and underscoring the growing gulf between the rich and the poor, would not appear until 1990.

Nonetheless, concern about the quality of health services in developing countries brought together a group of health researchers and donors at the Edna McConnell Clark Foundation late in 1986 to weigh the prospects of a "green revolution" in health, catalyzed by research.

Many believed that improved technology could solve the health problems facing the world's poor. Such an international research effort would lead to the cheap, effective and simple health technologies needed by the countries of the South much as the Consultative Group in International Agricultural Research (CGIAR) had contributed to the world's supply of food.

Others present, however, were sceptical about relying primarily on technology in improving the health of the poor people of the world. Would the technologies be applied? Would they become available to those in need? Would the poor be able to afford them?

Uncertainties about the success of a "green revolution" in health led those meeting at the Clark Foundation to decide against launching a new international research program. Instead, they formed the independent Commission on Health Research for Development to determine the role of research in improving the health and well-being of the poor and to recommend how to bring this about. The Commission concluded that research — broadly defined — was essential to improving human health and that research to support informed decision making was of the highest priority. In other words, scientific enquiry should influence decisions about health.

The Commission decided that health research was primarily country specific and that it must be inclusive, meaning that those affected by the problems must be actively involved in the process of finding solutions. This characterization of research became the basis for the strategy of Essential National Health Research

(ENHR). Using this strategy, a country's researchers, decision makers and people work in partnership to identify problems, set priorities and search for solutions using the methods of science. Needs and opportunities for international research initiatives emerge from national problems and plans.

The Commission evolved the strategy of Essential National Health Research as a means to achieve equity in health both within a country and between countries. While the Commission focused upon the plight of the poor people of the South, its recommendations apply throughout the world.

MOBILIZING RESOURCES

The first International Conference on Health Research for Development took place in Stockholm, Sweden, in February 1990. Conference participants endorsed the Commission's report and recommended the creation of an interim body, the Task Force on Health Research for Development, with a term not exceeding two years. This Task Force would carry on with the Commission's activities of supporting international networks aiding the ENHR process and advocating the relevance of health research for development. It would also develop an arrangement to mobilize resources for ENHR on a continuing basis. To help turn the Commission's recommendations into reality, the conference turned to two organizations with a research mandate: IDRC and the Swedish Agency for Research Cooperation with Developing Countries (SAREC).

IDRC and SAREC agreed to jointly take responsibility for the Task Force and asked the Edna McConnell Clark Foundation (USA) and the German Agency for Technical Cooperation (GTZ) to join them. The UNDP provided space for the Task Force Secretariat at its Geneva offices.

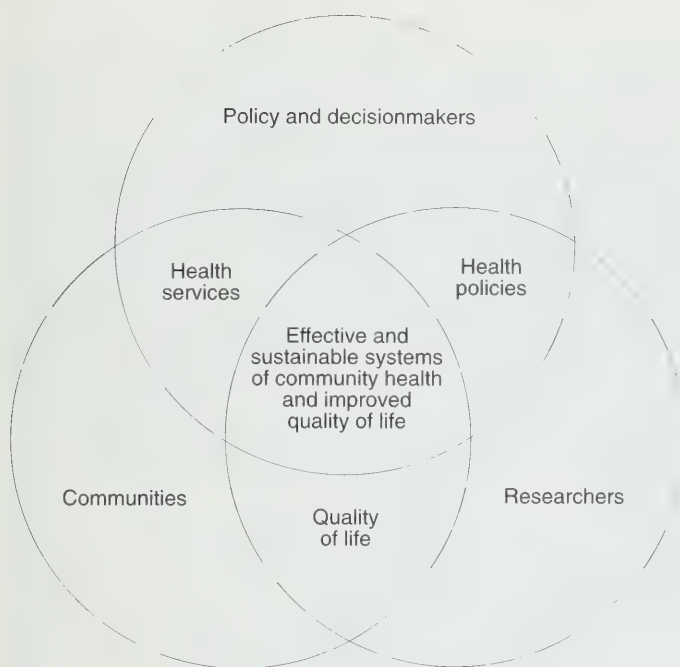
Thus the Task Force on Health Research for Development was formed in late 1990. By March 1993, eighteen

countries were implementing the ENHR strategy, and another eighteen were seriously considering doing so. Each country that adopts the strategy evolves its own ENHR process and uses different national organizations as the institutional base for the strategy. In some countries, the ENHR process was built up from the community, while in others it was led by academic bodies, non-governmental organizations, or



IDRC Stephanie Colvey

Midwives in India. The ENHR strategy actively involves those affected by health problems in the process of finding solutions.



The Essential National Health Research Process.

Source: Lilah Moore, IDRC

government ministries or institutions. In all cases, consultations carried out at many different levels, and the free and open debate among community members, researchers, health care providers and decision makers were the keys to success.

The second International Conference on Health Research for Development in March 1993 reviewed the work of the Task Force and decided upon the need for a more permanent international coordinating mechanism for implementing the ENHR strategy.

Representatives from eighteen countries presented their experiences with the ENHR process. The IDRC President, Dr. Keith Bezanson, noted that the ENHR concept united both the resources and the key players involved in delivering a basic public good at a time when the nation-state saw its role shrinking in this area. Dr. Bezanson also remarked on the participation and empowerment of the policy users — the people — inherent to the ENHR approach as well as its adaptability to different cultural settings.

Other positive observations contributed to the unanimous opinion that the facilitation of ENHR should continue. The participants adopted a Declaration on Health Research for Development, opening the way for the establishment of the Council on Health Research for Development (COHRED).

The ENHR movement had come of age. The interested countries and agencies had created a unique, non-governmental organization situated within the United Nations system and guided by a board comprised primarily of individuals from the countries using the ENHR strategy. UNDP, IDRC and SAREC agreed to be part of the Constituting Assembly.

COHRED was duly constituted on March 10, 1993 as a non-governmental organization and took up quarters

within the UNDP in Geneva. As of December 1993, the Council consisted of 34 constituent countries, agencies and organizations. These included the seventeen members of the Board, of whom 12 are from developing countries.

BLOWS TO HEALTH RESOURCES

From 1986 to 1992, when the Commission and the Task Force carried out their work, the world experienced an almost universal decline in the ability of governments to solve their people's problems. Health and social services received the greatest shock.

In most countries today, it appears impossible to provide quality services that are accessible to all people, including the poor and those at highest risk, at a price that a country can afford.

Until recently, the poor, their communities and their organizations rarely participated in making the decisions that affected their health and that of their families. The need for explicit choices and priority setting within the health sector to achieve equity was rarely considered by the health services or the decision makers. The provision of quality health services, accessible to all people, at a cost that a country could afford, was a challenge for the future. Unfortunately, the emphasis of research remained on new and better technologies. No doubt these technologies would improve the quality and duration of life. But for what portion of the world's people?

Today, all countries have to make choices concerning health and health care. Priorities have to be set that are based on sound, scientific information about problems and possible solutions. Research should provide the needed information and thus influence these choices.

The Essential National Health Research strategy is a way to make difficult choices and solve problems using the methods of science and involving the people, the researchers and the decision makers as equal partners in the process. Some countries are already using the strategy, and many others wish to do so. Most of these countries are poor and require technical and financial assistance to carry out their Essential National Health Research. COHRED and its allies in international development hope this assistance will be forthcoming and that the strategy will be applied ever more widely. Nothing less than the health and well-being of most of the world's population depends upon such action.

Dr. Richard Wilson was Coordinator of the Task Force on Health Research for Development and Coordinator of COHRED until December 1993.



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A NATION OF HEALTH RESEARCHERS

Eusèbe Alihonou has been a professor of obstetrics, gynaecology and family health since 1976. Now 56 years old, the Director of the Regional Health and Development Centre (CREDESA), is a member of some fifteen professional associations and the author of dozens of specialized works. He became Dean of Benin University's Health Sciences Faculty in 1987. We talked to him about Essential National Health Research (ENHR) in Benin.

REPORTS: Professor Alihonou, what are ENHR's objectives in Benin?

Professor Alihonou: A group of international organizations, including IDRC, UNDP, WHO, SAREC and GTZ, set up a special team for health research and development to explore the most effective mechanisms for promoting research in developing countries. The team was to investigate the status of research in developing countries and how they can benefit most from the opportunities available.

ENHR's aim is to use research to improve the quality of life of people in developing countries, through intersectoral cooperation and a multidisciplinary approach that brings together decision-makers, researchers and the community. Its ultimate goal is to promote health and development, based on equity and social justice.

REPORTS: What are Benin's highest-priority problems?

Professor Alihonou: We have identified thirty high-priority problems. Interestingly enough, these problems — which the people of Benin identified themselves — are not all strictly health-related. In most people's minds, health issues are inextricably linked with economic problems, inadequate infrastructure, and so on. People told us, for example, that roads serving rural areas are a priority. When we asked why, we were told: "We can't get sick people out without roads." We were also told that water is a priority. We have come to realize that peo-



IDRC: Daniel Le Touzé

In Benin, the health research priorities of villagers throughout the country were recorded, then distilled into a set of 30 nation-wide priorities.

ple are thinking very hard about their problems, even though they may not know how to read or write.

REPORTS: How did you identify all the problems?

Professor Alihonou: ENHR is an integrated strategy of organization and research management. It takes into account the shortcomings of traditional research systems and brings together researchers, decision-makers and the community. Generally speaking, researchers do not always focus on those health problems that decision-makers and communities consider a priority. The ENHR approach is to involve everyone at every stage of research and in Benin, that approach was used to maximum effect in identifying high-priority health problems. We set up six teams, one for each department. Each team studied its department in depth. Village and city neighbourhood meetings were arranged, giving community members a forum to express their views. The teams identified all the issues that com-

munities considered a priority. On August 23, 1991, a series of departmental seminars was held, followed by a national seminar on October 9-11 of the same year. The purpose of the seminars was to examine the status of research in Benin, determine priority areas for health research on the basis of problems identified by communities in the departments, and suggest research strategies designed to solve the problems. At the national seminar, the 252 problems identified during departmental seminars were condensed into 30 priority issues.

REPORTS: Did the national seminar also define strategies?

Professor Alihonou: Absolutely. It defined strategies relating to the principles and organization of ENHR in Benin.

REPORTS: What are those principles?

Professor Alihonou: We have defined five key principles. (1) Research, whether operational or applied, must be geared to solving

REPORTS

development problems or meeting the needs of the population. (2) The community must be involved at every stage of research. (3) Research must be conducted by multidisciplinary teams, with results disseminated to communities, decision-makers and researchers. (4) Research structures must be decentralized, comprising a national network, department networks and local networks, all integrated into a coherent system. (5) As far as possible, research costs should be kept to a minimum by mobilizing local as well as external resources,

and, where possible, by generating new resources on which the networks can capitalize. Resources should be committed for at least ten years; that period would of course encompass a number of implementation phases.

REPORTS: Those are the principles. What about organization? Let's look at the national organization: what are its constituent institutions, and what is the role of each one?

Professor Alihonou: The national organization is composed of seven permanent and six non-permanent members. The seven permanent members

are: the Benin Scientific and Technical Research Centre (CBRST); National Health Protection Directorate (DNPS); Regional Health and Development Centre (CREDESA); Benin National University Science Council (CS/UNB); Agronomic Research Directorate (DRA); Benin National Association of Traditional Medicine Practitioners (ANAPRAMETRAB); and Benin National Peasants' Organization (ONPB). The six non-permanent members each represent a departmental network.

REPORTS: Can you tell us about each institution's role within the national organization?

Professor Alihonou: The CBRST presides over and guides the national organization. It was assigned that role because it is involved across the whole spectrum of research in Benin, so health is no longer treated in isolation.

The National Health Protection Directorate was formerly known as the Public Health Directorate. It represents decision-makers within the ENHR national structure; its Director is the ENHR Vice-President for Benin. The Regional Health and Development Centre acts as a secretariat. In fact, ENHR first gained a foothold in Benin through CREDESA, thanks to the IDRC. The national organization has made CREDESA responsible for fund-raising.

Benin National University's Science Council is responsible for promoting senior teachers. It also comprises a research organization.

The Agronomic Research Directorate is an important component of the national organization. Agriculture plays a very significant role in the eradication of a scourge like malnutrition.

As for the traditional medicine practitioners, their inclusion represents a philosophy of building the new on the old, as the Béninois like to say. The new rope is spliced onto the old. We have to work together with traditional healers, who are great repositories of local knowledge. They are also members of their communities, just like the local peasants. By the way, we have made a point of dealing with genuine peasants, not with retirees or intellectuals who occasionally dabble in farming.



In the area served by Benin's Regional Health and Development Centre (CREDESA), the local population is encouraged to participate in vaccination campaigns.



Agence Pêriscoop

Eusèbe Alihonou discovered that villagers see solutions to many health problems in other sectors such as agriculture, the environment and the economy.

Some might wonder what peasants could possibly know about research; let me assure you, they know quite a lot. Intellectuals are not just people who have an education, who have been to Western schools. There are undoubtedly intellectuals among the peasants who know how to look for ways to solve their problems. If for no other reason, community members — peasants — must be involved in research.

And there is something else we must bear in mind: African universities are generally located in the major cities. This means that researchers have to travel to villages or local communities. If the community is already involved in the research, if it is already a part of the national research network, the researcher's job will be that much easier. Community members will trust the researcher and speak freely. This is crucial if research is to be successful.

REPORTS: I believe that the decentralized ENHR structure in Benin also includes departmental and even local organizations.

Professor Alihonou: Indeed it does. The role of the departmental organizations is to coordinate, plan, direct, follow up and disseminate research results. They are composed of the Prefect or his representative, the Department Health Director, a researcher from another development

sector and two influential members of the community.

The local organization's role includes facilitating, providing liaison between researchers and community members, and disseminating research results. It is composed of the Sub-Prefect, the Chief Medical Officer of the sub-prefecture or urban district, a researcher from another development sector and two community representatives.

REPORTS: Are these structures already operational?

Professor Alihonou: All the structures are already in place throughout Benin. We have already formulated a research program, and are now seeking the funding to implement it.

REPORTS: What impact will ENHR have on the people of Benin?

Professor Alihonou: The purpose of our research is to find solutions to specific problems. Under ENHR, research will focus on areas identified as high-priority by community members themselves. If researchers and communities can come up with solutions to the problems identified, and if decision-makers implement those solutions, people's living conditions will improve considerably. Successful ENHR activities will have a powerful impact. But I must admit that the problems we are talking about are formidable. They will not be easy to solve.

REPORTS: A final comment, Professor?

Professor Alihonou: The people of Benin have responded most enthusiastically to the initiative of involving them in identifying the country's major health problems. But they have also warned us: "Don't be like the others; don't whet our appetites and then do nothing." They are calling upon us to act responsibly. We must not disappoint them.

Jerome Adiakou Badou, Agence Pêriscoop correspondent in Benin.



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The Regional Health and Development Centre

The Regional Health and Development Centre (CREDESA — *Centre régionale pour le développement et la santé*), established in 1983, has three objectives: research, training and the delivery of rationalized health services. The Centre is located in Pahou, in southern Benin, 26 km from the capital, Cotonou.

Since its inception, CREDESA has developed a community-based information system for use by local residents. The community is involved in identifying problems, implementing solutions and evaluating results. This approach has made it possible for CREDESA to disseminate health information effectively. CREDESA representatives spend time in the villages, explaining research results to the local population. The Centre organizes seminars to disseminate research results, and uses songs to teach sound health principles. Benin television has devoted entire broadcasts to CREDESA activities. One such activity that has attracted public attention in recent years is undoubtedly home nutritional rehabilitation (HNR).

"Home nutritional rehabilitation is another type of information," explains Professor Eusèbe Alihonou, CREDESA's Director. Its purpose is to prevent and treat malnutrition, by reestablishing the nutritional integrity of children suffering from malnutrition. Children are fed a balanced diet, based on local foods and formulated by the mothers themselves (with support from health care professionals) in the community. Health care professionals teach HNR, using the "learning by doing" method. The first step is

screening for malnutrition, using body weight as a criterion. Through clinical examination, the type of malnutrition present can be determined and any complications identified. Once cases are identified, health care professionals meet with parents to schedule food preparation demonstrations.

Health care professionals and parents formulate menus together; the menus reflect parents' purchasing power and the family food supply. Local products are used exclusively. Suggested recipes are initially prepared by the demonstrators, with the mothers' active participation. After one or two learning sessions, the demonstrators remain as onlookers while the mothers prepare the menus by themselves. Later, midwives and social workers can ensure during regular visits that menus are being prepared correctly. Food preparation demonstrations in the home are preceded and accompanied by information sessions on nutrition, covering such topics as food groups, cooking habits, food hygiene and weaning. Demonstrations end with an evaluation: mothers are invited to recall the steps covered during the session.

REGAINING WEIGHT

Children with *kwashiorkor* (excess carbohydrate intake accompanied by protein deficiency) generally recover in three to four weeks, with a weight gain of some 750 g. Those with *marasmus* (protein and calorie deficiency) recover after six weeks, with an average weight gain of some 500 g.

Home nutritional rehabilitation offers a number of advantages. Intervention is accessible and

available to families where they live and work, unlike traditional nutritional rehabilitation, which takes place in an institution (hospital, health centre or nutritional rehabilitation centre). Moreover, HNR costs much less than similar services at health centres. Traditional nutritional rehabilitation usually costs US\$100 – US\$1,000, while an HNR menu costs between 30¢ and 60¢.

HNR, furthermore, fosters community participation. A dialogue is established between health care professionals and community members.

CREDESA found that out of 83 cases of severe malnutrition due to protein-calorie deficiency, 6 children died. This represents a mortality rate of 7%. With the traditional nutritional rehabilitation approach, mortality rates are 8–52%.

However, CREDESA has noted that the recovery of children suffering from malnutrition is hampered by the following factors: traditional practices, insufficient time between pregnancies, overly young mothers, mothers' economic activities, inadequate family food supply, parental conflict, and mother-child interaction.

Nonetheless, with the help of food preparation demonstrations and by learning about nutrition, mothers can improve both their knowledge and their practices. The enhanced knowledge sometimes leads to productive activities like gardening. Such activities have given rise to community groups, the most effective being those whose members have succeeded in caring for and saving children suffering from extreme malnutrition.

A MOVEMENT, A SPIRIT, A LIFESTYLE CHANGE

Pneumonia and other acute respiratory infections are a major cause of illness and death in the Philippines, despite the fact that effective treatments exist.

Young children are most at risk, particularly those who live in communities not served by physicians, according to studies by the Research Institute for Tropical Medicine, in the Department of Health (DOH). Most patients do get better when treated with inexpensive antibiotics, but the problem is first to find a qualified person to diagnose the illness, then prescribe treatment.

During the 1980s, the DOH launched a research project to determine whether midwives in rural communities could replace physicians for the purpose of diagnosing and treating acute respiratory infections (ARI). The researchers assessed a simple diagnostic method known as the WHO/ARI algorithm. It is based on two key signs: a respiratory rate of 50 breaths per minute or higher, indicating that antibiotics are required, and an indrawn chest, indicating a need for hospitalization. Researchers evaluated the algorithm in a five-year study involving tens of thousands of children in eight communities in the southern Philippines.

The study showed that midwives are indeed capable of diagnosing and managing acute respiratory infections. Using the WHO/ARI algorithm is also more cost-effective. As a result, the algorithm is now being introduced nationwide. The Department of Health expects that reductions in morbidity and mortality rates for respiratory illnesses will follow.

A SUCCESS STORY

"We call this a success story," said Dr. Tessa Tan Torres, a clinical epidemiologist at the University of the Philippines College of Medicine. The study addressed an important problem, was well planned and well executed. In this regard, it was atypical of many research studies, she told delegates at a conference on Needs-based

Technology Assessment in November 1993 in Ottawa.

"A former Secretary of Health once described health research in the Philippines as a state of nervous convulsion leading to no purposeful activity" because a large number of projects are never completed, published or utilized in health care operations, said Dr. Tan Torres.

But now the Essential National Health Research (ENHR) strategy offers hope for more effective health research. This DOH initiative aims to raise research standards in the Philippines to the same level as success stories like the ARI project, by promoting and developing a scientific and data-based culture throughout the health sector.

Jointly sponsored by IDRC and the Council on Health Research for Development in Geneva, the ENHR initiative in the Philippines aims to improve people's health by first setting priorities among different health problems. Then the relevant research questions are determined in a participatory process involving communities, researchers, and policy and decision makers. Thus, developing a national research agenda is a process determined by

both the practitioners and the users of research. Since research resources are limited, such a process allows priorities to be set in the broadest and fairest possible way.

EFFECTIVE AND EQUITABLE

By adhering to these principles, "we believe ENHR will lead to better, more effective and more equitable health care," said Dr. Tan Torres, who serves on the ENHR executive committee. "It will decrease the burden of illness and ultimately improve the health of the people."

According to Dr. Tan Torres, one of the most important achievements to date in the Philippines is the creation of an ENHR office within the Department of Health that will help direct research efforts across the country. Another major achievement is the development of the first ENHR agenda — a list of six research priorities that took more than two years to compile.

"It was a very complicated and democratic process," explained Dr. Tan Torres. "We spoke with policy makers. We commissioned five consultative groups, composed of people from the academic and clinical sciences, to review the available litera-



Children in communities not served by physicians stand to benefit from the research priorities identified through the ENHR strategy.



Moving forward on family planning goals will mean working with the Roman Catholic Church, to which more than 80% of Filipinos belong.

ture and identify important research gaps. We tried to define research needs from the people's point of view by conducting focus group discussions nationwide. All of the feedback we received was then input into a national conference."

The resulting agenda deliberately excludes studies on health problems for which funding is already available, such as cardio-vascular diseases, cancer and AIDS. The idea is to reserve money for issues that have rarely been addressed, said Dr. Tan Torres.

One of the priorities is to study the impact of indigenous beliefs and practices on health, including the relationship between cultural and religious beliefs on the one hand, and public health messages on the other. "For example, in the area of family planning, our country hasn't advanced at

all. In 1990, we had a population of 60.7 million and a growth rate of 2.3%," said Dr. Tan Torres. "Eighty to ninety percent of the population is Roman Catholic and the Church is a very strong institution. Therefore, we want to find out how to work with it to improve family planning and to decrease the growth rate."

RESEARCH FOR THE MARGINALIZED

Another priority is to conduct baseline epidemiological studies on mental health problems — a topic that was suggested not only by academics but also by ordinary Filipinos. Filipinos expressed concern about mental health and the large numbers of homeless people — many suffering from mental health illnesses — in urban areas. In addition, the agenda calls for research on the health problems of

marginalized groups such as street children, violence and disaster victims, internal refugees, political detainees and disabled persons.

Under the ENHR program, infectious diseases are also a priority, especially research on tuberculosis. Despite being one of the top five causes of illness and death in the Philippines, tuberculosis attracts very little attention. It is true that some research funds are already available for tuberculosis, said Dr. Tan Torres, but only for studies that specifically link the disease to AIDS.

The two remaining priorities are both concerned with health services. The ENHR agenda includes studies to evaluate the implementation of national health programs, and to develop strategies to encourage the rational use of drugs in hospitals.

For Dr. Tan Torres and her colleagues, the next step is to secure funding for these projects from the Department of Health and from outside sources, including international donor agencies. At the same time, they plan to try some advocacy work. "We want to create a demand for research and prepare policy makers for the data that results — data that they asked for but may not know how to deal with when it arrives."

The goal of this program, concludes Dr. Tan Torres, is to catalyze a revolution in health research. "ENHR is meant to be a movement, a spirit, a lifestyle change. We now have the political will to make that happen. But the success of ENHR will ultimately depend on the people who will be changed by it."

John Eberlee



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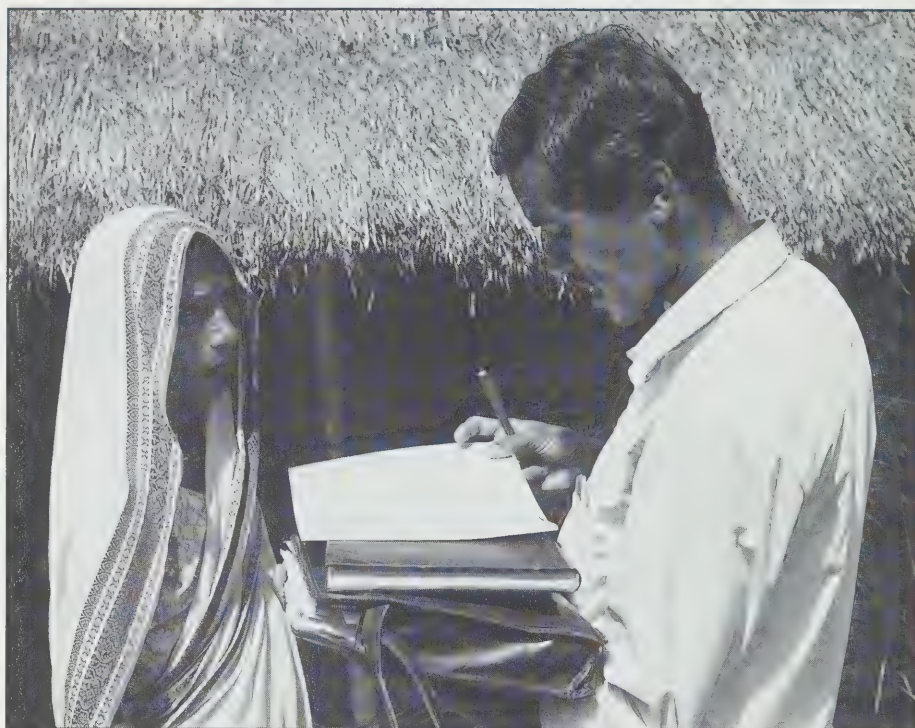
TARGETING BASIC HEALTH PROBLEMS

Within Bangladesh's overburdened health sector, a group of young researchers have set about charting a new course to address the country's neglected basic health problems. They have been spurred into action by the Essential National Health Research (ENHR) strategy, which unites researchers, communities and policy and decision makers to establish research priorities and pursue solutions to health problems.

Bangladesh is one of those developing countries in Asia where little research has occurred in the health sector. The small amount of research that has been done in this impoverished nation of about 112 million people, has taken place in biomedical fields that largely neglected the socio-economic aspects of peoples' lives that are so crucial for promoting health. It is these socio-economic aspects of health that policy makers must take into consideration if they are to respond effectively to the critical needs of the country. Against such a backdrop, the ENHR concept augurs well for the country. There has now been a national response to the international initiative conceived by the Commission on Health Research for Development and promoted by its successor organization, the Council on Health Research for Development (COHRED).

Leading the ENHR movement in Bangladesh have been a national non-governmental organization (NGO) known as the Bangladesh Rural Advancement Committee (BRAC) and a Dhaka-based international medical research institute — the International Centre for Diarrhoeal Diseases and Research, Bangladesh (ICDDR,B). The initiative has received active support from UNICEF and a host of other NGOs.

"The NGOs play an essential part in development, particularly in health," says Dr. Sadia A. Chowdhury, the national coordinator of ENHR in



IDRC: Neill McKee

Determining health research priorities in Bangladesh required careful and thorough surveys of residents in underserved communities.

Bangladesh and deputy chair of COHRED. "The structure and commitment that typify these organizations allow them to try out new ideas on a small scale, quickly and flexibly, which governmental organizations often cannot do because of bureaucratic, legislative and financial constraints. In this context, it's not in the least unusual that implementation of ENHR in the country should be an NGO initiative." She hastened to add that ENHR must have active government support to become an effective movement.

An example of the type of research inspired by ENHR in Bangladesh is that of Golam Azom, a university lecturer who is probing the impact of drug addiction on families in northern Rajshahi town. Based on the analysis of 145 cases selected by sampling techniques, he is trying to determine the socio-economic characteristics of drug addicts, including the factors responsible for their addiction, the nature and type of drugs used by them and the impact of addiction on their families.

The study should help explore possible measures for curbing drug abuse as well as suggesting the specific services that can be offered to the affected families.

In Dhaka, Dr. Shafinaz F. Chowdhury, a microbiologist, has been working on diagnostic procedures for the rapid diagnosis of Falciparum Malaria. Instead of conventional slide examination for diagnosis of malaria — a tedious and time-consuming process — Dr. Shafinaz is using the serodiagnostic method for rapid diagnosis of the disease. Malaria is endemic in Bangladesh: in 1993, nearly 150,000 people suffered from the disease. Dr. Shafinaz's study also aims at evaluating the immune status of people with falciparum, the most deadly strain of malaria, which has been rampant in Bangladesh since the early 1970s.

Two teachers of statistics at Jahangirnagar University, near Dhaka, have been probing the determinants of maternal and child health care in urban slums. Ali Ahmed Howladar

and co-investigator Ajit Kumar Majumdar worked laboriously to discover the socio-economic and demographic characteristics of the urban slums. Their inquiry centred on the common maternal and child health problems as well as the most common sources of health care delivery for the slum dwellers. The study, based on a sample survey of nearly 1,800 households at different shantytowns in Dhaka, revealed the extent of health problems being faced by the slum-dwellers.

Other on-going research projects include assessing primary health care interventions in coastal Bangladesh, examining the efficiency of health care delivery at hospitals and assessing the distribution and utilization of water-seal latrines in rural areas. When completed, the ENHR secretariat plans to disseminate its research findings through seminars and workshops with top-level academics, administrators, planners and policy makers. The secretariat also wants to "sensitize" policy makers and the media about the health problems as they emerge from the researchers.

The young health professionals are working under ENHR's Research Award Scheme (RAS), supported by IDRC. Begun in 1991, the RAS has supported six research projects in the first phase of the scheme, now nearing completion. At the moment, the ENHR Working Group in Bangladesh is reviewing another 20 research proposals for the second phase of the RAS, which will soon get underway. Eventually, the ENHR Working Group plans to provide financial grants to at least 30 potential researchers annually.

Since the ENHR concept was first proposed in Bangladesh in early 1989, a series of meetings and workshops resulted in the formation of a 15-member ENHR Working Group and a 21-member ENHR National Forum, both of which include representatives from NGOs and government. And over the past three years, the ENHR Working Group has carried out a number of activities. A 10-year prospective plan has been drawn up; an inventory of selected research institutions and investigators has been prepared; a list of research priorities formulated; and

a national ENHR coordinator appointed.

These activities have been initiated to act as catalysts in the process of implementing ENHR in the country. The overall objective is to develop national capabilities to carry out research in the health sector and disseminate the results for the use of researchers, policy makers, planners and administrators. Although an ENHR secretariat was established in August 1991, it is still hosted by BRAC and largely dependent on other organizations for research facilities.

"I believe in our own capacity ... each institution should have its own research facilities and capabilities. ENHR is hosted by other organizations, but it should emerge as an independent institution," said Dr. Halida Akhter Khanam, a member of the ENHR Working Group. She said that ENHR should help improve the environment of health research in Bangladesh while focusing on such fields as mother and child health, epidemic areas, health care seeking behaviour, and the quality and availability of health care. "Besides creating a national capability for research, we should also try to establish a linkage between research and policy formulation," says Dr. Halida.

Roushan Zaman is Chief News Editor of United News of Bangladesh (UNB) in Dhaka.



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CLOSING GAPS IN HEALTH EDUCATION

In developing countries, educational curricula and research topics for health studies tend to be imported from industrialized countries, often creating serious gaps between the research agendas of the educational institution and community needs.

However, an IDRC-funded project attempts to inspire new models of community participation in health education and research. "University Partnerships in Essential Health Research" involves 18 diverse educational institutions in 13 countries. The project is headed by two co-directors, Dr. Esmat Ezzat of the Suez Canal University in Egypt and Dr. Victor Neufeld of McMaster University in Canada.

For Dr. Neufeld, the aim of the project is to help universities build bridges with communities. The key element lies in encouraging medical students to participate in essential national health research as an integral part of their education. "There was a distinct realization that the education of health care professionals was not always geared to the actual needs of the community," he says.

But reforming university health education and research is a formidable

challenge. A more progressive research model involves the creation of projects derived from true partnerships between communities, universities and governments. "In this project, research ideas should not come out of medical students' heads nor from faculty members' favourite areas of interest, but instead directly from community interaction," Dr. Neufeld says.

This new model brings into play the expertise of Dr. Ezzat and the Egyptian coordinating centre. The centre has been instrumental in building a range of capacities not commonly considered in academic circles. These include teaching leadership and partnership skills to medical students so they can listen to communities and make connections between professional and regional groups, allowing time in the curriculum for students to engage in essential health research, and providing an organizational base within the university for health research.

The University of Makerere in Uganda, as one example, has used the centre's expertise to establish a partnership of its own. University students and faculty conducted a survey among Kampala community representatives on local health priorities. It uncovered concerns rarely addressed in the university research agenda: a safe water supply and public information pro-

grams about AIDS for families. Both topics have become research projects.

Research at the Christian Medical College in India found that low incomes were the main factor preventing women in the village of Vellore from going to health clinics. The response was to involve young women in local business activity to raise income levels. "Sometimes you need these concrete examples to show students how inter-related health concerns are with broader issues," says Dr. Neufeld.

Increasing information and communication channels between educational institutions is also a key function of the project, one that has been taken on by the McMaster University coordinating centre.

"We act as a clearing house of information," says Dr. Neufeld. Workshops, newsletters, a mini-library, training resources and the transfer of high-quality information through electronic mail or CD-ROM equipment to universities in developing countries clears a major hurdle in the logistical struggle for all project members "to be on the same page."

Dr. Neufeld and other project members realize that for real health partnerships to emerge, universities, communities and governments must have equal input. "A true partnership does not entail the university acting merely as a liaison, consultant or resource to the community," he points out. "Instead it means a complementary relationship in which all groups recognize the need and importance of working together."

Craig Harris



India. Low incomes can prevent women from visiting health clinics, proof that health education must address socioeconomic factors in health promotion.



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1994 award for best paper on Gender and Tropical Diseases



The Female Client and the Health Provider

The Female Client and the Health Provider is the topic of the fourth (1994) IDRC/TDR award on gender and tropical diseases. The award, jointly sponsored by Canada's International Development Research Centre (IDRC) and TDR, in the amount of C\$5,000, will go to the author or authors of the best paper on this subject.

Gender refers to the sociocultural aspects of the male-female dichotomy, as distinct from sex which in this context denotes its more biological basis. *Gender* refers to qualities, behaviours and roles ascribed by different societies to women and men.

The paper should preferably focus on one or more of the TDR target diseases (malaria, schistosomiasis, lymphatic filariasis, onchocerciasis, African trypanosomiasis, Chagas disease, leishmaniasis and leprosy) but as the issue of provider-client interrelationships is equally relevant to other diseases, health and family planning services, a broader health focus is also acceptable.

Many factors facilitate or inhibit women's use of health services: provider-client relationships is one of these factors. We invite submissions that explore this relationship. Women's experience of

services, as distinct from men's, understood in terms of gender roles in a particular culture; the position of women in a society and how it affects the care they receive; and differences in attitudes, expectations and perceptions of female clients and health providers are examples of acceptable topics.

The papers may include case studies and/or original research based on qualitative or quantitative data with a gender analysis of the findings. Submissions from social scientists, biomedical scientists, health workers and service users are welcome. Entries from women from developing countries and disadvantaged groups are especially invited.

The papers — in English, French or Spanish — may be based on either secondary sources or original research, and will provide a basis for future research that could be supported by the IDRC and TDR. They must be original, i.e. not published elsewhere; they should offer a critical review of current knowledge on the chosen topic; and they should focus on practical disease and control issues. They may be authored by one or more persons. Previous winners of an IDRC/TDR award are not eligible for the award. Papers

based on research conducted with the participation of women are particularly welcome.

Manuscripts should be no longer than 30 typewritten, double-spaced (A4) pages, including tables, figures and references, and should begin with a short summary in English.

All papers should be submitted by 15 August 1994 to: Dr. Carol Vlassoff, Secretary, Task Force on Gender and Tropical Diseases, TDR/WHO, 1211 Geneva 27, Switzerland. IDRC contact: Janet Hatcher-Roberts, Health Sciences Division, IDRC, PO Box 8500, Ottawa, Canada K1G 3H9.

It would be helpful if authors planning to submit a paper would inform Dr. Vlassoff by 15 June 1994. A selection committee, comprising representatives of IDRC and TDR, will review the papers soon after the deadline and the winning submission will be announced shortly afterwards. Arrangements for publishing the winning paper and possibly others selected for their high quality will be explored at a later date. IDRC and TDR may, however, choose not to select any paper if the quality of the entries are not of high standard or the above criteria are not met.

A MEXICAN APPROACH TO HEALTH PRIORITIES

With the severe financial crisis that swept across Mexico, the decade of the 80s proved almost fatal to the country's medical research and its system of public health care. A system that was remarkable for its scope and its social purpose. Fortunately, Mexican researchers have regained their optimism, with the support of decision makers and the political system. IDRC could hardly hope for a more favourable opportunity to assist in the development of a plan for Essential National Health Research (ENHR).

This initiative flows from a new philosophy of promoting public health research in developing countries, a philosophy of which Canada has been one of the promoters since it was launched in 1987. Mexico, too, has been a strong supporter of this approach: take for example the well known Mexican epidemiologist, Dr. Jaime Sepúlveda Amor, now the Deputy Minister of Health, who has been chairman since 1993 of the Council on Health Research for Development. This international body, better known under the acronym COHRED, arose out of the conclusions of a study, whose voluminous report led to the creation of national committees charged with determining subjects for essential national health research. Defining the broad lines of ENHR is not an easy task, however. Scientists do not like to favour one field of research over another, partly for fear of seeing their sources of funding dry up, if their own research should be pushed into the background, but mainly because it is extremely difficult for capable, devoted and committed researchers to give priority to one problem over another.

"Two statistics provide a good illustration of the vicious circle we have to break," says Dr. Sepúlveda. "90% of health problems arise in countries of the South, the so-called devel-

oping countries. Yet 95% of the human, technical and financial resources are in the countries of the North, in Europe or the United States. The secret is to break down the barriers of ignorance at all levels, including the mistrust and resistance that exist between researchers and decision makers".

"This calls for a change in mentality," adds Dr. Sepúlveda. "We have to break through this lack of communication. COHRED is helping to do this. Providers of funding want to have a clear picture of the problems; but scientists hate to establish priorities. You can see how important it is to have information."

COMISA: ACTIVATING ENHR

In the northern part of Mexico City is the Mexican Committee for Basic Health Research (COMISA). COMISA is expected to produce its final report on research priorities in mid-1994, a report that will be of use not only to developing countries. As the chairman, Dr. Adolfo Martínez Palomo points out: "In the health field as elsewhere, we are seeing a phenomenon of globalization. Diseases do not respect frontiers. Tourists from the North sometimes bring tropical diseases back to their countries. We have even seen how cholera, a disease that used to be thought of as typically Asian, can now cross the oceans and take root in Latin America, causing a veritable epidemic in Mexico (now under control). There is nothing to guarantee that it will not reach the United States one of these days."

The principal health problems in the major centres have already been identified, such as chronic degenerative diseases, accidents, cancers — in particular cancer of the uterus, which is one of the main causes of mortality among women of modest means, due to the lack of regular doctor's visits and thus of any general screening.

Other committees are studying the disciplines that should be promoted: molecular research, clinical research, epidemiology, health services and even the administrative and financial frameworks that need to be established or modernized. Some groups



IDRC: Denis Marchand

Among the challenges facing the Mexican health system is how to provide access for disadvantaged women to screening for illnesses such as cancer of the uterus.

prefer to concentrate on biomedical aspects of research. For others, the main focus is on the patient.

"What we are looking to achieve above all", says the chairman of COMISA, "is an integrated analysis of all aspects of medicine, from cellular research to population studies. This is a very ambitious undertaking, but I think that we will gain something from such a global analysis. We will at least find out what are the main challenges facing us in the years ahead. That is what COMISA is all about!"

Brigitte Morissette in Mexico City.



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BREEDING A BETTER BANANA

From a distance, the banana groves at the experimental farms of the Honduran Foundation for Agricultural Research (FHIA) in La Lima, in northeastern Honduras, look much like all the other groves that blanket the countryside: hot, humid and lush. In the dappled sunshine under a canopy of broad leaves, large, well-filled bunches of green fruit hang from sturdy trees.

But that's where the resemblance ends. These are no ordinary bananas. Careful inspection reveals that the fruit is distinctly shorter and stouter than the Cavendish dessert banana most North Americans and Europeans are familiar with. In its green, unripe stage, this banana is delicious cooked. When ripe, it has a pleasantly tart flavour reminiscent of apples.

More importantly, the new banana — code named FHIA-01 — resists the diseases that are devastating plantations throughout the tropics. It also grows well in poor soils and at cooler temperatures, offering some promise of extending the banana's range into semi-tropical or upland areas where today's heat- and humidity-loving varieties won't grow.

After decades of painstaking breeding, FHIA-01 — or "Goldfinger" as the world will come to know it — is the first banana variety ever bred that could replace the standard Cavendish banana. It may well save the world's banana export industry from collapse as diseases take an unsurmountable toll. More important yet, it could ensure reliable food supplies for the millions of people in Africa, Asia and Latin America for whom bananas and plantains are staple foods.

A GLOBAL THREAT

The story of Goldfinger began in 1959 when the United Fruit Company — now United Brands — witnessed the demise of the standard export banana, the Gros Michel, to race 1 of Panama disease. Fortunately, Gros Michel could be replaced by the



IDRC: Diane Hardy

The unique qualities of the Goldfinger banana — including its productivity — promise to improve food security for millions of people in Africa, Asia and Latin America.

Cavendish varieties that were resistant to the fungus that causes the disease. The industry was saved. But because no other natural variety existed to replace Cavendish if — or when — it too fell prey to disease, United launched a breeding program in Honduras to develop bananas that would withstand anticipated new diseases.

That foresight paid off, according to Dr Phillip Rowe, who heads FHIA's Banana and Plantain Improvement project. The diseases that United Brands anticipated would evolve to destroy Cavendish now exist. The two most threatening are Black Sigatoka, a fungal leaf spot disease, and race 4 of Panama Disease.

First observed in Fiji as recently as 1964, Black Sigatoka is "ripping through plantations" the world over. Spotted in Honduras in 1972, it had spread throughout Central America by 1984 and now reaches as far south as Ecuador. Much of Africa is also

infected by what's being called the black plague. "There's no way to stop its spread as long as conditions are right for infestation," says Rowe.

Attacking all major varieties of bananas and plantains, Black Sigatoka turns the plant's leaves a mottled yellow, brown and black, thus impeding photosynthesis. Depleted of its energy reserves, the plant cuts back its fruit production, often to half. This could spell hunger in areas where bananas and plantains are staple food crops. For exporters, Black Sigatoka is ruinous: the disease also causes premature ripening of the fruit. Although they appear normal, bananas from affected plants ripen and spoil before arriving at markets.

Black Sigatoka can be controlled, but the cost of chemical fungicides — a staggering US\$800–1000 per hectare per year — is prohibitive for all except large multinational exporters. Chemical control is certainly impractical for plantains, which are grown in scattered plantings on small farms, particularly since fungicides must be applied whenever a new leaf appears. In Guatemala, some growers are spraying up to 50 times a year.

The massive application of chemicals on plantations, usually through aerial spraying, is also drawing the ire of environmentalists and concerned consumers. What's more, says Phillip Rowe, the airborne fungus is developing a resistance to available pesticides.

As Black Sigatoka continues its devastating march, many small growers in affected countries are phasing out of production. Just outside La Lima, a discouraged farmer laments that he doesn't know how he can stop the devastation of his small plantation. Like most others, he cannot afford the expensive chemical controls. In the neighbouring country of Panama, more than a third of plantain farmers have abandoned production since Black Sigatoka struck in 1981.

Race 4 of Panama Disease may prove an even more formidable foe. Although it is now found only in Australia, Taiwan, South Africa and the Canary Islands, the soilborne fungus is spreading rapidly. Race 4 is a killer disease that wipes out crops

completely. And it cannot be controlled by existing fungicides. "The only control measure is genetic resistance," says Rowe.

A COMPLEX PARENTAGE

Breeding for that resistance is a major thrust of the research housed at FHIA since 1984 when United Brands turned over its research program. FHIA is financed by the USAID and the Honduran government. IDRC and other donors have supported the breeding program since 1985.

As researcher Dr Franklin Rosales explains, breeding bananas is more complex than breeding any other crop. (see box *A banana breeding primer*). The main difficulty is a trait that endears bananas to consumers — its lack of seeds. Fortunately for farmers, bananas and plantains are easily multiplied by removing and replanting the sprouts produced by mature plants. But the sprouts are clones. Identical to their parents, they offer no hope for improved varieties.

Breeders therefore turn to wild or other varieties that may not have good eating characteristics but do produce viable pollen or seeds. Desirable characteristics such as disease resistance can be combined in new plants and eventually crossed with standard varieties that have all the desirable eating qualities. The FHIA program draws on a gene pool of more than 800 different cultivars collected in Southeast Asia, the bananas' centre of origin.

It's a staggering endeavour. As Rosales explains, in each of the 24 years of breeding that led up to Goldfinger's development, some 10,000 hybrid plants were set out in the fields. "We have to walk through all the rows," he says, "look at plant size, fruit bunches, see if they are resistant. Then we select just a few." To date, fewer than 20 "very elite" hybrids have been retained for their potential as cultivated crops.

Banana breeding is also painfully slow. A full cycle, from seed to seed, takes three years. Compare this to rice, says Rosales, where you can obtain three crops a year.

Even pollinating the flowers is difficult. At first light, workers on ladders quickly hand pollinate the one or two flowers that have opened that day

before the sun and heat dry out the sticky pollen. Each flower represents a hand: the process will be repeated every morning for a week or more before the entire bunch is pollinated.

Three months later, the bananas are harvested. But there's no way of knowing where the few — if any — pepper-corn-sized seeds are hidden without crushing and sieving the entire bunch. In FHIA's facilities, specially trained workers strip the fruit off the bunches and peel the bananas by hand. Although a press developed by Dr Rowe has made the mashing a little easier, it's still a laborious, messy process. At FHIA, more than 20,000 bunches of bananas are crushed each year in the search for seeds.

The seed harvest is meagre — one or two seeds per bunch. And not all of these will grow into plants. The banana-seed germination rate is poor, below five percent in the wild. Using tissue culture techniques that involve

"rescuing" the embryo in the seeds that have them and growing them in a nutrient medium, Drs Rowe and Rosales have boosted the germination rate to 50 percent. The young plants are then transplanted into nursery beds until large enough to be set out into the fields.

In Goldfinger's breeding, the first big breakthrough came in 1977 with the development of a hybrid that was resistant to burrowing nematodes — a widespread pest controlled by potent, expensive pesticides — and race 4 of Panama disease, and that had a good bunch size. Crossed with a female Brazilian apple-flavoured "Dwarf Prata" clone, it showed good resistance to Black Sigatoka. FHIA-01 was born.

A TOUCH OF GOLD

Drs Rowe and Rosales have unbounded hopes for Goldfinger. They're justifiably proud. Tested in six

A banana breeding primer

Normally, when breeding for genetic improvements in crops, the breeder can choose both the male and female parents for making cross-pollinations. This is because most species of plants are diploids (they have two sets of chromosomes), which have both seeds and pollen.

Not so for bananas and plantains. While diploid plants are common in Southeast Asia, the cultivars of all bananas and plantains grown for local consumption and for export are triploids (they have three sets of chromosomes). Triploids of any species are ordinarily sterile. This sterility is caused by the genetic laws that dictate that any parent must contribute half of its chromosomes to a sexual union and these chromosomes must be in complete sets. Half of three sets would be one and one-half: this incomplete set means that no seeds are produced when triploids such as the Cavendish bananas are pollinated.

Fortunately, there are some triploid banana clones that do produce seeds when pollinated, making genetic improvement of both bananas and plantain possible. The triploid Gros Michel is one such plant. It contributes all three sets of its chromosomes intact when its eggs are united with the pollen of the male parent. But seed production is very low: Gros Michel produces an average of only two seeds per bunch when pollinated with diploids.

Because banana breeding relies on fixed female parental lines, any genetic improvement must come from the male parent. As Phillip Rowe explains, "it's as if one woman was the mother of a village with different fathers." The bulk of breeding work, therefore consists of developing a "father" with the desired characteristics.

Goldfinger has an international lineage. Its "mother" was a Brazilian, apple-flavoured banana variety known as Dwarf Prata. Its "father" was the result of multiple crosses of a wild Southeast Asian plant originally selected for its resistance to burrowing nematodes.

Latin American and African countries as part of the International Musa Testing Program sponsored by the International Network for the Improvement of Banana and Plantain (INIBAP), it has proven resistant to race 1 of Panama Disease and to Black Sigatoka. "We got lucky," says Dr Rowe: in trials in a number of other countries, including Australia, FHIA-01 has shown strong resistance to race 4 of Panama disease and to the burrowing nematode.

In fact, Goldfinger appears to have it all: a hardy dessert banana, it can be grown without pesticides, and in areas where traditional banana varieties don't grow. Highly productive, its fruit can be eaten green, boiled or fried as chips. FHIA's workers, in fact, now prefer it over their traditional plantain and it is almost three times as productive. The fruit's shipping qualities are about the same as Cavendish's, but the fruit ripens slowly and sequentially, hand by hand, over a couple of weeks.

Goldfinger's unique flavour when ripe should make it highly popular, say the researchers. In countries where consumers can choose between Cavendish and other apple-flavoured bananas, the latter are preferred and sell for about twice the price of the Cavendish. In informal test trials in Honduras, "everybody loved the flavour," says Dr Rowe. What's more, Goldfinger doesn't oxidize, retaining its golden yellow colour when cut. That makes it ideal for fruit salads, juices and purees such as baby foods.

Goldfinger's disease-resistance and hardiness make the hybrid even more important for domestic consumption than for export. As Drs Rowe and Rosales point out, it could be grown by smallholders in areas where Cavendish cannot. Goldfinger is amazing even its breeder: this past fall they harvested a bunch that tipped the scales at about 50 kg.

Goldfinger is only one arrow in FHIA's bow. PHIA-02, a Cavendish hybrid highly resistant to Black Sigatoka, is also being tested in various countries. Equally promising is FHIA-03, a rustic cooking banana being tested in seven African and eight Latin American and Caribbean coun-

IDRC: Diane Hardy



It takes thousands of seedlings and several decades to breed a new banana that has the right combination of characteristics to please growers, marketers and consumers.

tries where it's proving more vigorous than conventional plantains and cooking bananas. It's even thriving in areas where dessert bananas and plantain won't grow such as in poor, dry, acid and rocky soils. FHIA-03 also appears to be resistant to Moko, a bacterial disease and to Race 2 of Panama Disease.

The superior hybrids developed for banana breeding are also proving useful in developing high-yielding, disease-resistant, tasty plantains. And this is where Dr Rowe sees the greatest potential, both for increased food availability in tropical countries and for export markets. "What we really anticipate happening," he says, "is that North Americans and Europeans who have never tasted a plantain will become plantain consumers."

The work is not over. Goldfinger will soon be field-tested in farmers' plots in many more Latin American and Caribbean countries. But many growers are not waiting for the final results to be tabulated. Word of Goldfinger's testing has brought interested parties from Cuba, Ecuador, Israel and South Africa to FHIA. South Africa's Leeways Laboratory Ltd plans to set up a tissue culture lab in Honduras so it can reproduce plants more quickly for clients that include the multinational company, Dole. FHIA, in collaboration with other labs, expects to

have seedlings available for commercial use next year.

All this interest is good news to Dr Rowe. "We have been thinking of ways to get these two hybrids (FHIA-01 and 03) out to the African countries that need them most. I am convinced that FHIA-01 would immediately double production for the 70 million Africans for whom plantains are a staple food," he says. Early estimates put the cost of the new hybrid seedlings at US\$0.50 per plant. "That's a very good price," says Dr Rowe, "It looks to us like the best possible use of funds for humanitarian purposes in West Africa."

Neither Rowe nor Rosales expect major banana exporters to jump on the Goldfinger bandwagon. Any change in variety requires changes in packaging, shipping techniques, temperature control, etc, says Dr Rowe. It's unlikely they'll go through that expense as long as they can control Black Sigatoka. But, if present trends continue, that day may not be very far off.

The researchers also anticipate that the multinationals will eventually bow under growing pressure from environmentalists and consumers for a pesticide-free product. "There's a great future for organically grown bananas," says Leeways director Jeff Parsley.

Touting Goldfinger as an environmentally friendly or ecological banana may well entice consumers in industrialized countries. But the real winners will be the millions of small producers and their families for whom Goldfinger promises more food, at an affordable price.

Michelle Hibler with field research by Diane Hardy in Honduras.



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CLEAN WATER FOR ALL

In the opinion of Maria Therezinha Martins, Director of the Microbiology Department at São Paulo University's Biomedical Sciences Institute, the shantytowns around cities, although physically close to government sanitation services, are generally as short of adequate drinking water as remote rural areas.

Water quality monitoring services in shantytowns are also seriously, if not completely, lacking. For some years now, with financial support from IDRC, Ms Martins has been directing a research program to enhance the performance of a variety of microbiological tests in order to make them effective in detecting viruses, bacteria and parasites in the water supplies of shantytowns and remote rural areas.

The research, conducted in cooperation with the National Health Secretariat, focuses primarily on tests for coliphages, hydrogen sulphide (H_2S) and P/A (presence/absence). "To date," says Ms Martins, "we have concentrated on improving test performance in the field. We would like to put together a commercial kit containing low-cost microbiological tests that are easy and quick to use, and are reli-

able, accurate indicators. I think we've done it! The Brazilian government is seriously thinking about including the tests in its water quality monitoring program and training its personnel to use them."

As a site to evaluate test reliability, improve interpretation methods and facilitate the tests' use in different environments, Ms Martins chose Intervalles, an ecological reserve located in the midst of the Atlantic tropical forest in the high Sierra do Mare. Intervalles was once famed for its wild animal hunting, gold and sulphur mines, and palm heart crop. Now under government protection, it is a vast nature interpretation centre and highly popular tourist destination. Just over 150 people — former miners and forest workers and their families — live there year-round. They are responsible for overseeing the vast resources of the dense, rich forest.

One might ask why Ms Martins chose a remote, almost uninhabited natural site. "It has become very difficult to find completely pure water anywhere on earth," she explains. "The presence of a single human being or animal — wild or domesticated — means there is some risk the water will be contaminated. That risk seems to be minimal at Intervalles, though water tests have shown that coliphages are

present in domestic reservoirs and small streams. Clinical examinations have indicated that 80% of the population has some form of chronic diarrhoea or parasitic disease. But that should come as no surprise: wild animals and livestock bathe and defecate in streams, while people build their latrines near those same waterways."

Things are just as bad in periurban communities like Villa Bayana, a site Ms Martins has also selected for her research. Villa Bayana is a shantytown located outside the municipality of Santos, some 45 km from São Paulo. Its rapid, disorganized growth has been a thorn in the side of the municipal authorities. It consequently has no permanent water supply or quality control facilities. The water supply system set up by the community is rudimentary, and vulnerable to all types of contamination. To make matters worse, most latrines and sewage pipes are located near wells and the water distribution system.

The lack of clean water has a detrimental impact on both health and the economy, for the authorities and for poor families alike. High infant mortality is endemic, as is parasitic disease. Immunization campaigns are too costly for the government, while families cannot afford the medication they need. Brazil has thousands of such



Access to reliable and inexpensive water-quality testing could reduce the risk of infant mortality and parasitic disease for shantytown dwellers.

shantytowns, yet health authorities limit the availability of standard water quality tests because of their high cost. Ms Martins feels that reliable, easy-to-use field tests should be marketed, aimed at showing people living in shantytowns and remote areas the quality of the water they drink and whether it needs to be treated.

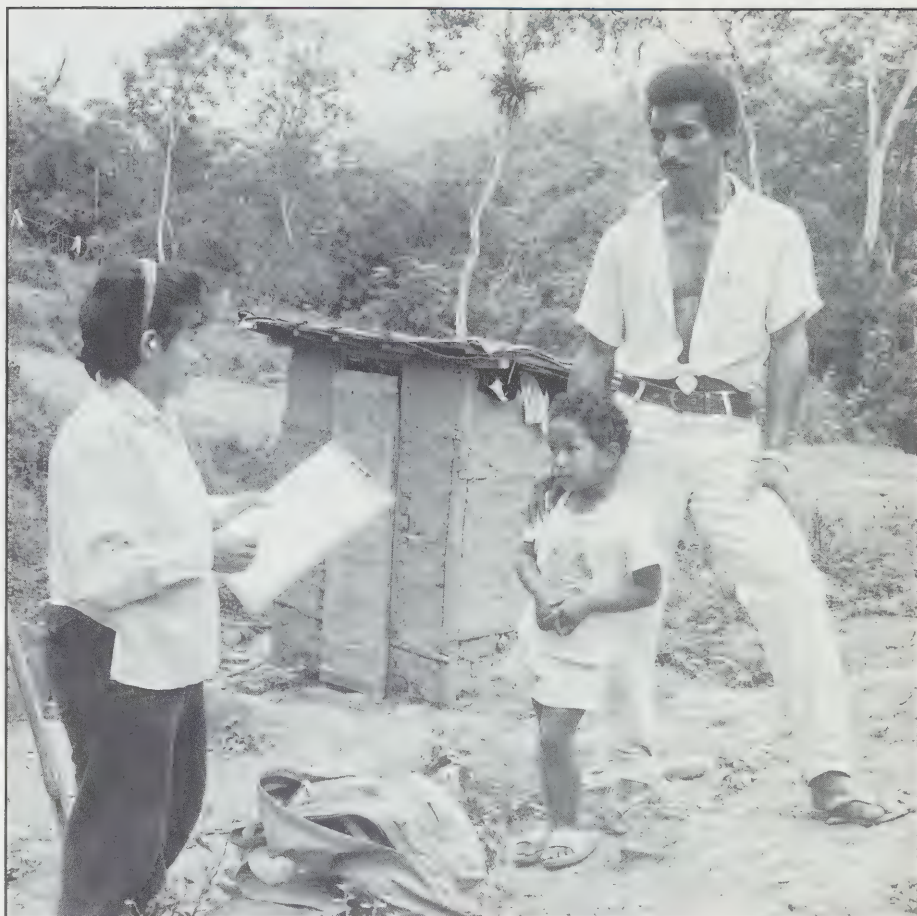
TRANSFER AND EDUCATION

Will people who are uneducated, perhaps even illiterate, find it easy to learn how to use the tests properly? Ms Martins has no doubt they will, though she carefully points out that technology transfer cannot take place without a transfer of knowledge. In her view, education is the key to the project's success.

She backs her statement by describing her research team's initial experiences at Intervales. When the team first started testing the water, locals were surprised. Though they suffered from intestinal parasites and chronic diarrhoea, it was difficult for them to associate their health problems with the clear, limpid water they were drinking. Information sessions on contamination factors, sanitation and health were organized. Photographs taken through a microscope were used to show people the parasites, viruses and intestinal worms found in contaminated water and living in their own infected intestines. By watching test procedures, people saw that initially clear water reacted with chemicals, becoming cloudy, malodorous, and forming murky deposits. They could hardly remain indifferent to such unequivocal evidence of contamination.

One local resident then volunteered to launch a water quality monitoring program in the community. After receiving some basic training, he started to sample the water in streams and reservoirs, using the microbiological tests to analyze the samples. Whenever he finds any trace of contamination, he informs everyone in the community and recommends that the water be boiled, filtered or treated by adding chlorine. He then cleans and disinfects all contaminated equipment.

The community slowly came to accept the notion of checking water quality before drinking it, treating it



Community programs to monitor water quality require an information program for residents on contamination factors, sanitation and health.

when necessary and even eliminating sources of contamination. Community members monitor and protect a number of underground springs and their waterways. Their health practices are slowly changing. "Without the consciousness-raising process, it would have been very difficult to get anyone interested in the problem," Ms Martins states. "When people know how and why they get sick, their motivation to eliminate the causes of their sickness rises sharply. And now they have the tools they need to do just that." Ms Martins has more than thirty years' experience in microbiology applied to health and environmental engineering, and water quality monitoring.

In the past, a National Health Secretariat employee would collect water samples at Intervales and send them to a laboratory in São Paulo, more than 350 km away. Since test results took

weeks to come through, they were generally useless. By the time they reached the community, the damage was done. But very soon now, employees of government agencies monitoring water quality, and even members of some rural and periurban communities, will have the means of efficiently doing the job themselves.

Denis Marchand in Brazil



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SÃO PAULO'S TROUBLED WATERS

In São Paulo, South America's largest city and the continent's industrial centre, the price of industrialization can be seen in the murky, contaminated waters of the Tiete and Pinheiros Rivers that cross the sprawling megalopolis.

What is not so clear is the effect that these rivers — choked with sewage and industrial waste — have on the groundwater supply, to which they are connected by a shallow aquifer.

Treated water from the Upper Tiete basin and a reservoir fed with water from the Pinheiros River supplies most of São Paulo's 17 million residents. The remainder of the 'Paulistanos' rely on groundwater, often drawn from badly constructed wells. In addition to many other sources of contamination, the groundwater is threatened by pollution from streams.

Tainted water and water shortages are familiar realities for millions of Paulistanos. Late in 1993, for instance, about 300 residents of Pirituba in northern São Paulo blocked a highway for six hours to protest a water shortage. About 1,000 families were without water for three days, in tem-

peratures above 30°C. "We cannot live in this heat without water," says one woman. Many desperate people used water from contaminated wells. "Now 20 people have hepatitis from drinking bad water," said one angry community leader.

Particularly for the three million urban poor living in the belt of favelas (shantytowns) ringing São Paulo, the shortages and degradation of the water supply are serious problems. Most of these people, former rural dwellers from Brazil's poor northeast, still find themselves living below the poverty line. Their new neighbourhoods are without basic urban services, creating grave difficulties in waste disposal and water supply.

The urban poor can expect little assistance from government sources: the ongoing political and economic crisis in Brazil means there are no resources to carry out research on the gravity of water supply problems and contamination of valuable groundwater. But an IDRC-supported project brings some possibilities for improvements.

Part of the Latin American network of IDRC-supported projects in urban hydrology, the project addresses groundwater contamination and water

shortages, among other issues. "We want to determine the correlation between the surface water and groundwater," says Dr. Nelson Ellert, project leader and associate professor at CEPAS (Centro de Estudos e Pesquisas de Aguas Subterraneas), one of the few South American institutes that conducts groundwater research. The centre is located at the Institute of Geosciences, University of São Paulo (USP). "Knowing that the rivers are so polluted, and that they mostly run on permeable layers, we want to determine whether or not there is a problem, and if so, detect where it is, and its magnitude."

The current research is the second phase of a recent collaborative project between CEPAS and the Institute for Groundwater Research at the University of Waterloo (IGR-UW) in Canada.

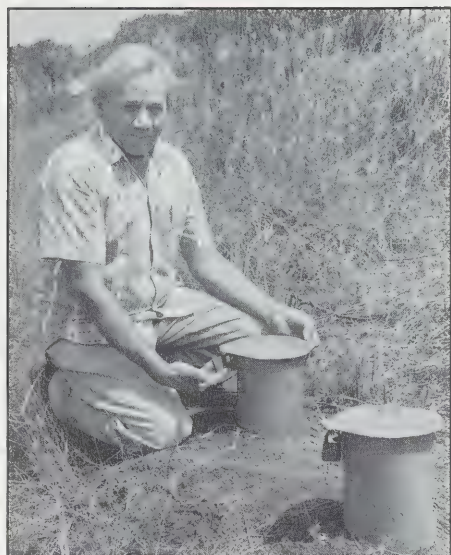
KNOWLEDGE CENTRE

Ellert says IGR-UW's role was greater in the first phase, but is currently limited mainly to transfer of technology. "The idea is for them to help us to create a centre of knowledge from which we can irradiate knowledge to the surrounding area. It is easier and less expensive for me to



Polluted streams in the São Paulo area are a potential source of contamination for groundwater that supplies millions of residents.

Wells to probe the depth and quality of groundwater in the São Paulo region were drilled at three sites where contamination is an imminent or actual problem.



IDRC: Denis Marchand

go to Argentina or Bolivia than for a Canadian expert," Ellert says.

The second phase will use the new methods developed to identify the sources, types and magnitude of contamination near the Tiete, Pinheiros and Tamanduati Rivers, and develop new analytical methods for groundwater study and environmental assessment in subtropical humid urban environments.

The project's investigation wells are located at three contaminated or threatened sites in São Paulo: at the university itself, which is located beside the Pinheiros River in central São Paulo; near the international airport at an ecological park beside the Tiete River, known to be contaminated by a landfill site; and the Tamanduati River, which carries heavy metals in effluent from the city's petro-chemical industries to the two other rivers.

Ellert says the project already has some tangible results and byproducts. The university site is a good example. "Before, the water company had been pressuring us to reduce our consumption of water at the university. We have constructed seven deep wells for our research and, as a result, are now supplying 70% of our own needs," says Ellert.

And preliminary study results show that pollution of groundwater from the Tiete, Pinheiros and Tamanduati rivers may not be as generalized as feared. A thick layer of clay along the

riverbeds prevents seepage into the groundwater. At present, the water table is higher than the rivers' waters, and therefore recharge to the aquifer does not occur; however, excessive pumping may lower the water table below the river level, inducing seepage of contaminated water into the aquifer.

But pollution is already coming from other sources. "In many places, we have found that the construction and maintenance of wells is the main reason for the pollution of deep wells," says Ellert. For instance, some wells are constructed with their heads below the ground's surface, so when it rains, the water runs inside. "This is like introducing your vein to very dangerous poison," Ellert says.

FUTURE PROBLEMS

Mathematical models developed at the University of Waterloo using information gathered about groundwater behaviour during the project have alerted researchers to future problems. In areas with many deep wells, the water table is sinking at a rate of 3 to 4.4 metres per year. "So these groundwater sources get depleted through the use of deep wells, the water table sinks, and this means there is a possibility of very polluted water being introduced into the groundwater in future," says Ellert. "It seems that in 30 years we will have some problems with the water flowing from the river into the wells, here at the university and at other sites."

The project also had a larger spinoff: the city water officials contracted CEPAS to do a study of groundwater resource potential in the entire São Paulo area. CEPAS found that São Paulo has much potential for more deep wells, which range between 60-350 metres in depth. These wells would be of particular benefit to poor residents in unserviced areas as well as hospitals, hotels, schools and industries, all of which face water shortages.

Study results will allow the water authorities to make better water management plans for the future. "If there is a critical area where there is a poor water supply, and we have already detected high potential for groundwater, for instance, we can suggest that the water company drill wells there," says Ellert.

Findings from the project and spin-off study will also be relevant for other cities in Brazil with problems similar to São Paulo's, and throughout Latin America and other subtropical regions where there is little information about groundwater resources and their vulnerability to contamination.

But Ellert says that São Paulo's urban poor will be the most immediate beneficiaries of the application of knowledge gathered by this project. "As the city grows continually, areas surrounding São Paulo have become crazy. Urbanization has become clandestine — people occupy a piece of land and start to build there and create a problem because there are no services. Then the municipality arrives and has to reduce the problem by giving electricity, sewage and water," says Ellert. "But with the kind of information we are developing, the water authorities can make local studies and produce water for these areas."

Kirsteen MacLeod in Brazil



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THE LEGACY OF MALAYSIA'S TIN MINES

Although it would be difficult to tell from an airplane, the thousands of ponds pocking the Malaysian landscape are not a natural feature. They are the unfortunate legacy of decades of mining tin — one of Malaysia's best known natural resources — from huge open pits.

The "slurry" ponds left in the wake of the tin mines range in size from a few hectares to several square kilometres. They are filled with tailings, rainwater, garbage, sand, clay and silt up to a depth of 40 metres. "Slimes" — a mining by-product made of finely ground ore — sink toward the bottoms of the ponds. But several centuries are required for gravity to fully compact the slimes into a solid mass.

In the meantime, the ponds pose environmental and safety hazards and

occupy land desperately needed for housing. Some 14,000 sq. km of the peninsula are affected, including parts of the capital, Kuala Lumpur, and the city of Ipoh.

Now, Malaysian and Canadian researchers have found a way to use latex, or rubber, to rehabilitate these abandoned leftovers of tin mining. Simply put, they found that latex — another well-known natural resource of Malaysia — could be used to separate the solids from the water in the slurry ponds.

RECLAIMING VALUABLE LAND

Traditionally, land developers have reclaimed the valuable land by pumping out the water and backfilling over the slimes. Since it is illegal in Malaysia to dump contaminants in rivers, and the cost of dumping at sea is prohibitive, the slurry usually ends up in pits or in other ponds. Often, reclaiming one pond simply creates another.

Even the reclaimed land is of dubious value. It is common for the land to

subside, damaging roads, bridges and houses. An estimated 250,000 Malaysians live in buildings that are cracking and crumbling, and that number is increasing as people migrate to the cities to be nearer their work.

A better method of reclaiming the land was needed, allowing separation of the solids and the liquids in the slurry, so that the water could be removed and the ponds filled in properly. The combined effort of two Malaysian universities, the Geological Survey of Malaysia and McGill University in Montreal has achieved an effective and speedy solution.

Latex — produced in abundance in Malaysia — is mixed into the slurry along with chemical conditioners. The amount of latex and chemicals used in the mix depends on the size and depth of the pond, the topography of the pond bottom, and the relative concentration of liquids and solids in the slurry.



Thousands of open-pit tin mines in Malaysia are no longer in production and require rehabilitation to avoid environmental and safety hazards.

GETTING TO THE BOTTOM OF THE POND

The latex mixture causes the liquids and solids to separate, a process that can take a few seconds or a few hours, and the solids fall to the bottom of the pond. The water can then be pumped out and treated. The sediment left behind can either be taken out, mixed with soil and returned to the hole, or fill can be added directly.

The IDRC-sponsored research called upon specialists at the University of Malaya's Department of Geology, the Universiti Teknologi Malaysia's Faculty of Civil Engineering, and the Geological Survey of Malaysia.

Dr. Raymond Yong, who heads the Geotechnical Research Centre at McGill University, worked in Malaysia with the research team to provide support in laboratory testing, analysis and selection of reclamation techniques.

FIRST-HAND KNOWLEDGE

Dr. Yong's centre has many years of experience in slurry pond management and reclamation. Moreover, he has first-hand knowledge of the ponds. Born in Singapore, Dr. Yong grew up in Malaysia and swam and bathed in the ponds as a child, just as many children do today.

"We were all very naive," says Dr. Yong, who has spent the last 37 years in Canada, some 20 years of that in research at McGill. "There is no bottom you can stand on. Any sediment on the bottom is very, very soft."

Slurry ponds are not unique to tin mining, he points out. "They occur all over the world from all other kinds of open-pit mining. They are an inevitable consequence."

Dr. Yong has also worked on reclamation projects in Alberta's tar sands in the wake of oil "mining"; in Jamaica where bauxite was the product; and southwest of Orlando and Disneyworld in Florida where slurry ponds were left behind by phosphate mining.

The approach is essentially the same in each case, he says. Removing the water from the slurry so that the solids fall to the bottom and harden requires chemical, physical or natural treatments. Sometimes it takes all three methods to do the job.

In the Malaysian case, slurry ponds scheduled for reclamation within three years in the Kuala Lumpur area were identified. Data was collected on the depth of the water and the slurry, and a profile drawn up of drainage and the pond bottom.

"This is the first time we have been able to achieve a working relationship between the two universities, one of them Chinese and the other Malay, and the government researchers."

Most pond bottoms have between five and 25 metres of sediment consisting of clay, silt and sand — the tailings from the mine. Conventional, inexpensive techniques were used to map the pond bottom, including the use of sonar — the first time it had been used in this type of situation. Samples of the sediment were removed for laboratory analysis.

A number of techniques for "de-watering" the slurry were tested, including the application of local substances. Latex proved to be the best. As Dr. Yong points out, the best remedy is often near at hand. Dealing with a similar problem caused by bauxite mining in Jamaica, he found that yams were ideal "flocclulants" — substances that cause the separation of liquids from solids.

Dr. Yong says that there are other ways of dealing with pond reclamation, but this is one of the more effective and quicker methods. "The method used depends on the final time and money constraints and land-use requirements. It is not a more expensive method if you consider time to be an expense. If previous methods took a year and this reduces it to one-tenth of that, how do you pay for time?"

But, he adds, some developers may be quite happy to use conventional means and wait for compression to rid the sediment of the water content and for the land to settle. With conventional methods, though, there is still the problem of the additional pond created by the pumped-out slurry.

The research has sparked interest beyond Malaysia. A regional workshop held in 1992 to explain the technique attracted researchers from Singapore and Vietnam.

VALUABLE COLLABORATION

In addition, the four-year project has brought together Malaysians who generally have little or no contact. Malaysia has two major linguistic and cultural groups — Malays and Chinese. The project marked the first time researchers from both groups collaborated. Malaysian government mine researchers also joined the project at a later stage.

This co-operation was perhaps the greatest achievement of the whole project, says Dr. Yong. "This is the first time we have been able to achieve a working relationship between the two universities, one of them Chinese and the other Malay, and the government researchers."

"We managed to get all four groups together, working not only in collaboration and co-operation, but in a spirit which has never been achieved before."

Maureen Johnson



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ALONG THE WORLD'S COASTLINES

From his marine biology laboratory atop the Life Sciences Building at Dalhousie University in Halifax, Nova Scotia, Dr. Gary Newkirk keeps in touch with biologists and social scientists scattered throughout the world's coastal areas.

Maintaining links among researchers in developing nations is a vital part of Dr. Newkirk's role as coordinator for the Coastal Resources Research Network (CoRR). In the past dozen years, he has offered training and shared aquaculture technologies with people at research institutions in many countries and regions including Sudan, India, the Philippines, Chile, and the Caribbean.

CoRR is the descendant of the IDRC-supported Mollusc Culture Network. The focus of the new network is still tied to research on the best methods to grow and manage marine species but it has broadened from oysters to include other plant and animal life.

CoRR's broader purpose is to assist researchers to develop the means for improving production from living coastal aquatic resources. Achieving this goal requires community involvement in management and innovations in culture technology.

For years, IDRC has recognized the potential of shellfish such as clams and mussels to provide a nutritious food source for people. Shellfish are also a valuable cash crop. In warm tropical countries, it is possible to harvest up to two crops of oysters in a year. The difficulty, as Dr. Newkirk and his fellow scientists have learned, is finding an appropriate species and "farming" method that fits into the larger context of peoples' lives.

The common biological and technical problems associated with most aquaculture projects provide the rationale for CoRR's existence. These problems can include finding enough seed supply to begin operations or developing a management model for the established venture. In its search for solutions, the Network co-ordinates



The Gambia's oyster fishery is dominated by women who sell the oyster meat to workers returning home.

Gary Newkirk

equipment, technical know-how, and, most importantly, people.

One example of these linkages involves a new oyster hatchery in Malaysia where researchers hope to produce enough seed to support oyster culture in that country. The director of the Malaysian hatchery also supervises research being carried out by an Indonesian graduate student who is involved in an IDRC-supported project. Indonesia is currently conducting experimental field work to try to understand the biological cycle of its oysters.

FROM JAMAICA TO THE GAMBIA

In the Gambia, a West African country that tried to stimulate oyster culture during the late 1980s, the "rack" technology developed by researchers in Jamaica was successfully transported across the Atlantic. Mangrove poles were substituted for the bamboo used in the two-tier structure that the Jamaicans had designed to haul the strings of oysters out of the water. This tech-

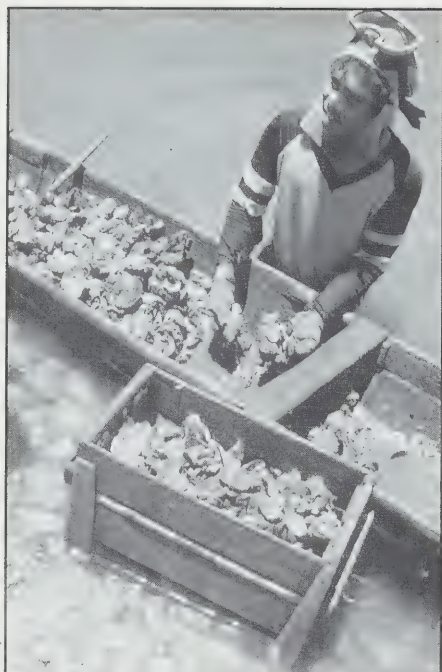
nique aided in drying off fouling organisms such as algae.

The development of the technology to culture and harvest oysters in Jamaica is a "home-grown" success story in which local scientists and oyster farmers played a large role. Nonetheless, despite a ready market for the product, oyster farming has yet to reach its potential in terms of providing a reliable source of income.

"We developed a successful component technology," notes Dr. Newkirk, "thinking it would turn into a self-sustaining business. But if you look at aquaculture and compare it with agriculture, you realize no one in Jamaica raises just one kind of crop. Part of our problem with raising oysters in Jamaica is that we don't have a farm to put them in."

SOCIOECONOMIC CONTEXT

Researchers and project scientists associated with CoRR increasingly believe that an understanding of the social and economic context in which



Gary Newkirk

Sapian, the Philippines. Research on sustainable and productive use of aquatic resources requires community participation and a multidisciplinary approach.

aquaculture projects exist is critical to their success or failure. To that end, CoRR's role in ensuring that information is shared among project participants in isolated parts of the globe becomes all the more valuable. In addition to its "Out of the Shell" newsletter, the Network organizes international meetings.

Iloilo City, in the Philippines, was the site of one such Network meeting in October 1992. Biologists, economists, food scientists, and government officials from five continents met to review the experience of those involved in aquaculture — mainly oyster culture — projects. Discussion and workshops revolved around "participatory research" in aquaculture. The term describes the benefits associated with finding ways of involving the people cultivating and harvesting the marine crop in conducting the actual research or making decisions on what research is needed.

In agriculture, involving the farmers in defining the problems and designing the research needed to find the solutions is a well-established practice. In aquaculture, suggests Dr. Newkirk, the technology has too frequently been transferred without enough consideration of local conditions and context.

"I guess in twelve years I've learned that the world isn't as simple as I thought," reflects Dr. Newkirk. "It's not just a question of biological research and adapting the technology to suit local growing conditions. Your chances of success are greatly diminished unless you take a broader approach and involve people from other disciplines. That realization has led us to where we are going with the Network today."

One model for the future may be a current initiative in the Philippines. Research into five marine species — including three varieties of seaweed and giant clam — is centred in the communities near a research lab to the west of Lingayen Gulf. Rather than farming only seaweed or giant clams, it is hoped that people will choose from a number of options, some of which may require new culture methods to achieve the best results.

LOCAL DECISIONMAKING

A second project in the Philippines that builds on an earlier collaboration between IDRC and the South East Asian Fisheries Development Center focuses on helping the community take charge of its marine resources and coastal environment. A fisherman's association has been formed and, with the help of a non-

governmental agency called PROCESS (Participatory Research, Organization of Communities and Education towards Struggle for Self-Reliance), communities on Malalison Island are being urged to select leaders and make decisions about which species should be cultivated for food and profit.

A multi-disciplinary approach is also applied in Jamaica, where a farmers' collective with political and economic clout is being established. Guidance from sociologists and economists affiliated with the National Development Foundation of Jamaica and the University of the West Indies has been part of the process. In South America, the government is permitting villages along Chile's coast to manage their own aquaculture ventures independently.

Dr. Newkirk believes CoRR and the type of collaborative fisheries projects it encourages can give Canadians "a broader understanding of marine resource problems." In some countries, people have begun to integrate the raising of seaweeds and scallops. Dr. Newkirk says a working knowledge of how to integrate marine species will provide the models Canadians will need as coastal aquaculture intensifies to replace lower yields from traditional fishing methods.

Because fisheries in countries such as the Philippines and China are at the edge of collapse, they are looking for solutions now, notes Dr. Newkirk. "We can not only help find solutions but learn strategies from them that will help Canadians solve our problems in the future."

Jennifer Henderson



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Green Technology for Community Profit

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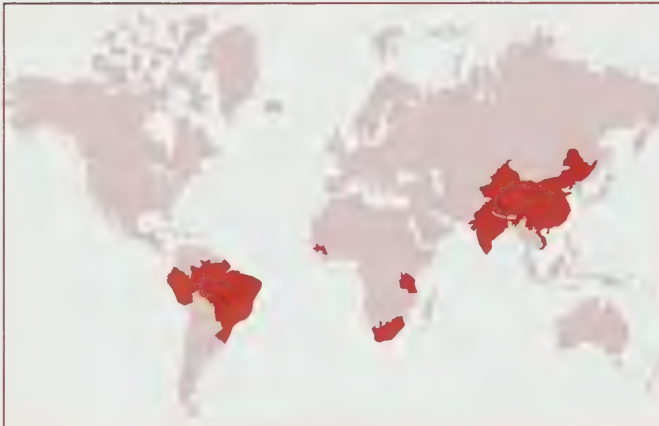
REPORTS

VOLUME 23, NUMBER 1, APRIL 1999



FOCUS

IN THIS ISSUE



IN THIS ISSUE, WE REPORT TO YOU ABOUT RESEARCH RESULTS IN THE FOLLOWING COUNTRIES: BRAZIL: P. 18, ECUADOR: P. 15, PERU: P. 8, GUINEA: P. 10, SOUTH AFRICA: P. 26, TANZANIA: P. 6, INDIA: P. 20, CHINA: P. 12, VIETNAM, P. 14.

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This issue of IDRC Reports explores the diverse world of “green technologies”: those technologies which are environmentally sustainable, provide income and employment to poor communities, and reduce the dependence of developing countries on imported materials and processes. IDRC has provided support to a wide range of research initiatives in this area including production and commercialization of food products, utilization or recycling of waste, and a third category — natural products — which includes essential oils, non-timber forest products, and medicinal plants.

While the initiatives described herein are successful examples of green technologies at work, the specific technology in each case is only a small piece of the puzzle. Income-generating initiatives based on green technologies invariably work best when there is also strong community support and interest, and when the methods and outputs are closely matched to the needs and culture of the local population.

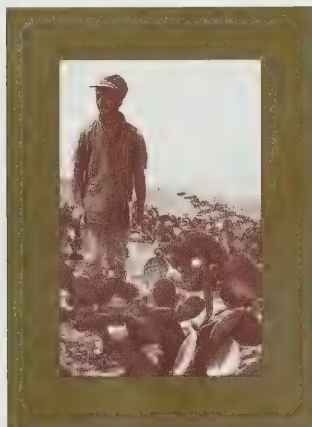
Can the application of green technologies be extended to many more poor regions of the world to provide income and needed products? Can greater access to international markets be achieved for some of the value-added products, to earn scarce hard currency? By helping generate income while still protecting the local environment, do green technologies constitute a good model of sustainable exploitation of natural resources worldwide? More research is needed to chart the effective application of green technologies in future.

National policy makers have a key role to play by putting into place “enabling policies”. Indeed, it is clear that cooperation between researchers, entrepreneurs, government policymakers and the local community will be essential to the future success of green technologies in the South. ©

EILEEN CONWAY
Editor in Chief



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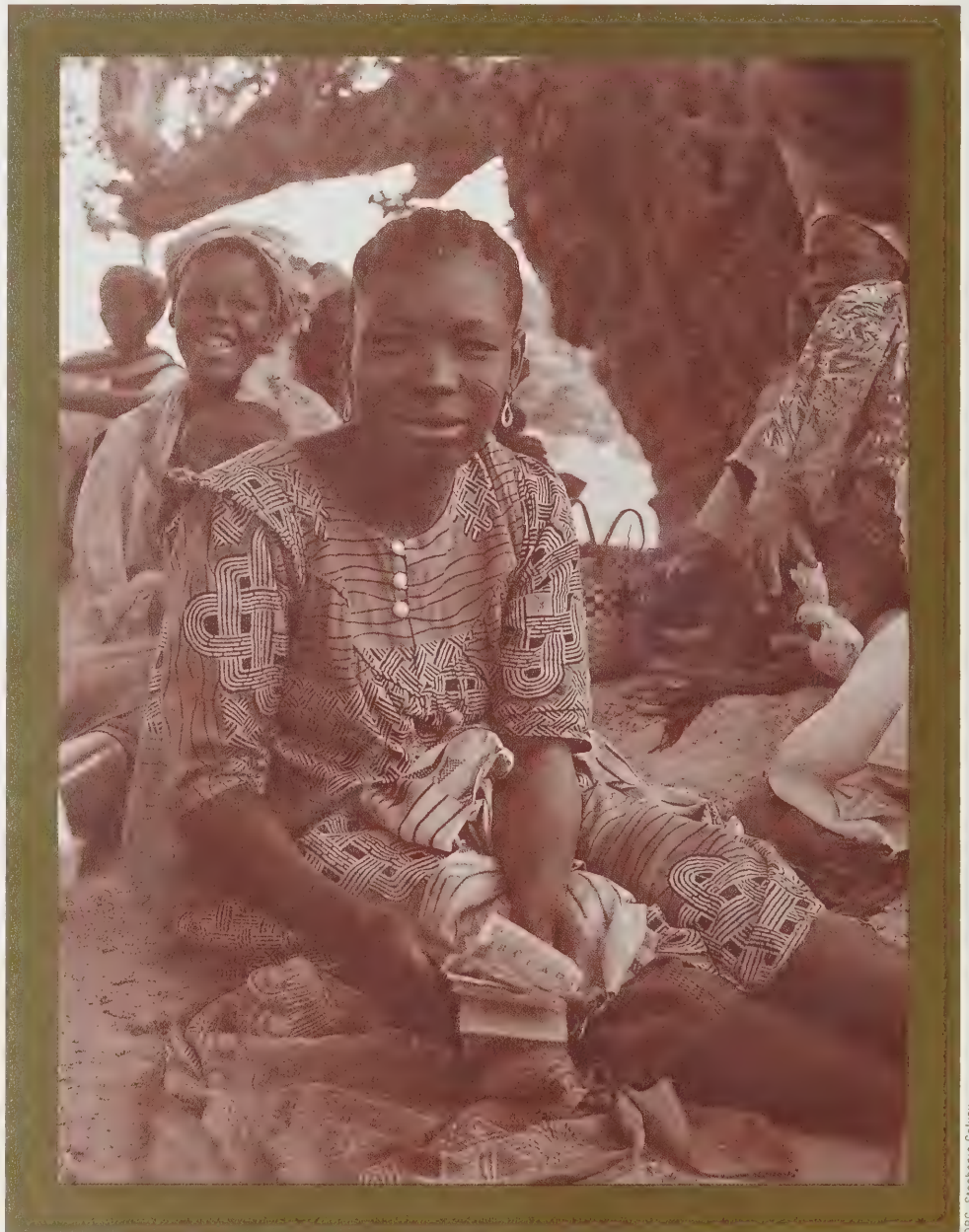
GREEN TECHNOLOGY: LOCAL RESOURCES FOR COMMUNITY PROFIT

Thirty-five years after independence for Africa, fifty years after Bretton Woods, it is time to take stock. Over those years, many countries have invested billions of dollars in development assistance. What has come of these investments? Where are the results? Can development really be exported at all? Development projects have succeeded only infrequently, and most have done little for their intended beneficiaries. It would seem that the model of development underlying such projects has had only marginal impact.

Progress does not necessarily come from grandiose and costly projects copied from technologies and solutions developed in countries of the North. In any case, the economic crisis of the last fifteen years, the collapse of the Soviet bloc and the drop — whether related or not — in funding from Western countries will force most governments in the South to assume their responsibilities directly and fully, and to draw up a new model for development, one that is more autonomous and on a more human scale.

At a time when capital is scarce, and viable results even scarcer, green technologies hold out a real hope for developing countries — the hope of exploiting their local resources in a sustainable way, and generating local income and jobs at the same time. Fortunately, developing countries have great potential wealth in their resources. And these resources, although often unrecognized, are highly varied.

Among animal products, we find meat of course, but also leathers and hides, gelatin and steroids. The realm of minerals produces oil and industrial



Burkina Faso. Green technologies create the potential for revenue generation and employment through sustainable, community-based exploitation of natural resources.

materials, but also precious and semi-precious stones, fertilizers, and clays. The plant kingdom offers the greatest and most varied range of possibilities: medicinal or aromatic herbs, plants that yield dyes or steroids — quite apart from those that are staples of human sustenance.

Depending on the circumstances, green technologies have many names: we can refer to

them as adapted technologies, as the transformation of non-timber forest products, or the upgrading of local raw materials. Beyond the subtleties of terminology, what the countries of the South need above all is to take advantage of their own resources, so that they can meet their basic needs, create jobs and generate income for their people — while at the same time protecting the integrity of their local environment.

This idea is not new. The West's industrial development in fact passed through a similar stage of exploiting local raw materials. The same thing happened in many earlier civilizations: when writing was first invented, some 7,000 years ago, Sumerian texts of the time speak of trade in myrrh, a high value-added resin used in making perfumes. In Africa, many local raw materials have been successfully commercialized for centuries: perfume plants in Morocco, spices in Zanzibar, salt, indigo, gum arabic and gold in West Africa.

VALUE IN LOCAL PRODUCTS

For several years now, IDRC has been funding research projects on various kinds of green technology, focusing on three main sectors. The first is in the area of transformation and marketing of food products. Food production in fact is still the main economic activity in many regions. Upgrading the value of these local products, wherever possible, is thus a priority for the local processing sector.

In Ecuador, Colombia and Peru, cassava farmers benefit from research to produce and market flour for many uses

from their perishable cassava crop. Research on small-scale processing of local oilseeds in Tanzania and other parts of East and Southern Africa is generating income for rural communities, especially women, from the sale of vegetable oils and feed cake as well as providing access to these products for their own diet and as animal feed. In India, women's groups run small enterprises to generate income and employment by producing and selling popular foods based on local sorghum and millet in a program supported by IDRC.

The transformation of by-products and waste is a second area of research that IDRC has supported. Often the by-products of local activities can be re-used to make new products of use to the community. For example, coal cinders from power stations can be used to make cement or to prepare a replacement layer of arable soil where the ground has been eroded by wind or acid rain. Other cases are sugar-cane residues that can be used to make pharmaceutical products, and by-products from the manufacture of antibiotics that can be made into biosorbents for removing heavy metals from industrial effluents.

Most of the other projects deal with what are called chemical products of botanic origin, non-traditional agricultural products, non-timber forest products or simply natural products. These plant substances are transformed into products with a higher commercial value. Such products may include, for example, vegetable oils (used for food or in soap-making), essential oils (extracted through steam

WHAT IS GREEN TECHNOLOGY?

What do we mean by green technology? The idea has changed over time, as it has adapted to the changing technology needs of countries of the South. In Canada, as elsewhere in the North, the concept evokes notions of clean-up and recovery — correcting past mistakes or trying to avoid potential negative impact on the environment. In countries that have not had to put up with the plague of industrial pollution, green technologies refer to commercial products created not only for economic motives, but also for environmental, social and cultural benefits. This new approach has arisen out of the problems caused by the exploitation of natural wealth that developing countries suffered during the colonial and post-colonial period. These countries are poor in terms of capital, because the few investments that were made remain the property of foreigners, who often repatriate the value-added (legally or otherwise) to their country of origin (in the North). The most common source of foreign exchange lies in the exporting of local raw materials in their crude form. When these resources are extracted and handled, often by foreign managers ignorant of the local environment and customs, the result is devastating. Most of the time, it is short-term interest that prevails. Moreover, the economy of these countries often depends

almost exclusively on the export of a single product such as oil, cocoa, coffee, or sugar.

GOING BEYOND SHORT-TERM POLICIES

From its inception, IDRC's Green Technologies Program was designed to counter this neo-colonial, short-term approach. The results have shown that it is possible to use the same scientific and technological principles, but to apply them towards developing:

- small-scale facilities that are still profitable, but at a human scale;
- methods for the local transformation of raw materials;
- environmentally sustainable transformation of indigenous products that form part of the local biodiversity;
- procedures that require little capital while making greater use of local labour;
- methods of work and operation that take account of local customs and the wishes of the local people involved as workers and users;
- procedures that take account of the ways in which people react to environmental changes, and the capacity of the environment itself to adapt to such changes;
- local development that is based on the use of technology to diversify sources of income.

distillation or by the use of solvents), waxes, resins and gums, as well as products derived through physical extraction processes.

These natural products have many uses — in some cases, they have been known to the local people for centuries. For food and drinks, they can be used as flavourings, colorants, antioxidants, conservation agents, thickeners, emulsifiers and sweeteners. In the area of cosmetics and perfumes, there are fragrances, oils, fats and colorants. Some are used as medications or insecticides.

Certain natural products can be marketed as intermediate inputs to the chemical industry. In the last few years, IDRC has been particularly interested in medicinal plants, a sub-group of natural products. Where the plant is already well known and used in western pharmacology, the work focuses on encouraging local processing, as an alternative to simply exporting raw materials. Where the plant is limited to local pharmaceutical use, studies have concentrated on finding ways to permit easier and more systematic use by local people.

THE ROLE OF RESEARCH

Frequently, it is necessary to conduct research in order to find new resources that can be developed. An example is the “anthocyanic colorants” project in Burkina Faso, which attempted to find new local natural dyes to replace the imported synthetic ones. Various projects in Africa and Latin America have also looked into the possibility of deriving essential oils from indigenous plants for local and international markets, and to develop small-scale industries to process plant essences in the countryside.

It often happens that research can lead to an improvement in existing technologies that may have been in use for a long time. This is the case for example with the “fired brick” project in Rwanda, which is trying to improve traditional techniques for making bricks, and the “traditional dyes” project in Guinea (see page 10).

Sometimes new technologies have to be invented that will provide greater value-added for local resources already in use. Such is the goal of the “Canada-Vietnam Cashew Apple Commercialization” project (see page 14). New technologies often have to be created to meet local needs, as in Tanzania, where researchers have come up with new adhesives and new insecticides based on local products for the country’s plywood industry (see page 7).

IDRC’s Green Technologies Program has shown time after time that it is possible to make real use of technology in the interests of local people. The fundamental purpose of green technologies is to create jobs and sources of income. The challenge is to choose technologies that will lead to high value-added products that can be marketed and that will benefit the most disadvantaged people.



More energy efficient brick production from Rwanda’s clays is one example of the myriad opportunities for autonomous economic development using local resources in the South.

The contribution of green technologies to sustainable development does not always get the recognition it deserves. We do know, however, that these technologies help to combat poverty, which is one of the main causes of environmental degradation in the South, by encouraging projects that generate income and promote small businesses. Besides helping to protect the biodiversity of forests, wetlands and other natural environments, green technologies help to strengthen and enhance local cultures and take advantage of indigenous knowledge. In this sense, they represent a new philosophy of technology, one that is directed towards a more authentic way of working with local communities. 🌍

PIERRE ZAYA, *director, technology and environment program (IDRC Ottawa)*, SERGE DUBÉ, *senior program specialist, environmental technology (IDRC Nairobi)*, and BILL EDWARDSON, *leader, green technologies working group (IDRC Ottawa)*.

A LEG UP FOR TANZANIA'S WOOD PRODUCTS

Most wood products manufactured in Tanzania disintegrate at a young age. But a research project under way could extend the life expectancy of these wood products and yield significant dividends for the environment.

The project, which links the Tanzania Industrial Research and Development Organization (TIRDO) with Forintek, a Canadian research institute, began in 1991 to develop new, water-resistant wood adhesives based on locally available materials. After reaching most of its initial objectives, the team was granted additional funds by IDRC to develop safe and effective wood preservatives from natural pesticides.

Tanzanian mills have in the past relied on imported wood adhesives to manufacture plywood and particle boards. However, foreign exchange is scarce, so they cannot afford the best glues. The only commercially available alternatives are adhesives that contain urea formaldehyde resins, which lose their strength when exposed to water or to Tanzania's humidity.

The average wood panel starts to crumble within a year, says Bonaventura Mwingira, project leader and head of chemistry and food research at TIRDO. "In my house, I had to remove one of the boards after everything fell down in the master bedroom."

Tanzanian wood products are also vulnerable to fungi and insects, especially termites, which "devour everything," says Mr. Mwingira. The country imports some wood preservatives, but they are expensive, environmentally harmful and toxic to humans. Most of the wood used in house construction is therefore left untreated.

Homeowners face a losing battle against termites. Untreated wood rafters must be replaced every two to three years. By comparison, a properly treated rafter would last at least a decade under worst-case conditions.

Both the lack of dependable adhesives and the high cost of wood preservatives are a threat to forest reserves. The faster that boards must be replaced, the faster trees must be felled. The researchers hope that longer-lasting Tanzanian wood products will help put the local forestry industry on a more sustainable footing.



Preservatives and glues made from local resources save money for Tanzania's plywood industry and ease pressure on forest resources.

Forintek Canada Corp

Using laboratory facilities at Forintek, Mr. Mwingira and his colleagues have developed water-resistant adhesive formulations for plywood and particle boards. The principal ingredient in both is wattle tannin, an extract of the mimosa tree, which is usually exported since it has almost no local use. Other additives include sunflower oil, cashew nut shell liquid (CNSL) — also available locally — and other substances.

In 1994, M/S Tembo Chipboards Ltd, of Mombo, Tanzania, began using one of the adhesives and almost immediately turned a healthy

profit. Tannin-based glues cost slightly less to make than the urea formaldehyde adhesives but are far superior, says Mr. Mwingira. Testing is already underway on another tannin-based glue that uses more cashew nut shell liquid and less sunflower oil to yield an even stronger, cheaper product.

Meanwhile, the search has begun for local, environmentally friendly plant materials for use in wood preservatives. The candidates include pyrethrums, such as Chrysanthemum, whose insecticidal properties have been known for more than 2,000 years. Cultivation of pyrethrum flowers for export is already an important source of income for some 1.8 million peasants living in highland areas of Tanzania, who sell their produce through a central processing and marketing board.

According to Mr. Mwingira, the final product will likely be a blend of several ingredients, since tannin and CNSL appear to have useful pesticidal properties as well. "At home, local people use CNSL to paint their posts, which are not attacked by insects, although this has not yet been proved scientifically." ■ JOHN EBERLEE in Ottawa



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POTTERY IRRIGATION ON PERU'S ARID COAST

Although they were not always so, the Andean foothills surrounding Lima are today a terrain practically empty of trees or other plants. Between May and November a little rain turns the tops of the hills green. Average annual rainfall here — as along the entire Peruvian coast — is a meagre 1-2 cm.

"A hundred years ago, these hills and valleys would have been covered by forests," says Barbara León, sweeping her arm across a bare — save for a few hardy cacti — landscape in the rural community of Collanac, about 30 km southeast of Lima. León, an industrial engineer, is executive director of TECNIDES, a Peruvian NGO. She attributes the loss of the original forests to years of overgrazing by livestock and excessive harvests of wood for household use or to fuel steam locomotives.

In order to encourage residents of Collanac to reintroduce trees and plants to this area, León is leading an IDRC-supported project that is testing a novel irrigation system for peri-urban agriculture. About 2,000 people live in Collanac, a community without electricity, water or sewage services. The average monthly income of \$US190 per family is less than half the official poverty level for a family in Lima. With a view to improving family incomes and restoring vegetation, the project is promoting cultivation of two valuable plants: the prickly pear cactus or tuna (*Opuntia ficus indica*) and the tara tree (*Caesalpinia tinctoria*). The prickly pear is the host for the cochineal insect, from which carmine — a valuable natural colorant used in the food and textile industry — can be extracted. In addition, fruit from the prickly pear fetches between 50 cents to a dollar per kilo, depending on the season. As for the tara tree, it is excellent for reforestation in arid lands owing to its low demands in water and soil quality. Moreover, its fruit can be powdered to produce a

Clay pots and a unique irrigation system are helping reforest the foothills near Lima.

natural tannin for leather tanning or exported to developed countries as a raw material for the production of gallic acid, a high-value commodity used in the leather, cosmetic and

pharmaceutical industries.

TRAPPING MOISTURE FROM CLOUDS

An important obstacle to cultivation of tara and prickly pear along the Peruvian coast has been extremely low rainfall. But plenty of water regularly passes by overhead in moisture-laden fog heading from the Pacific Ocean into the Andes. The vanished coastal forests used to trap some of this moisture naturally.

The Collanac project reproduces this water-trapping process artificially using a technology applied in an earlier IDRC project on the Chilean coast. The technology, known as fog collectors, consists of large panels (about 12 m by 4 m) of fine mesh positioned along hilltops. Some of the incoming fog condenses on the mesh, drips into plastic troughs and flows to storage tanks at the foot of the hill. "In principle, each collector should provide enough water to cultivate one hectare," says Barbara León.

The fog collectors at Collanac were built using low-cost materials available locally such as bamboo posts treated with a tar preservative, notes Javier Blosier, an agricultural engineer with TECNIDES. Five collectors have been installed (at an altitude of 500 metres), with 15 more collectors partially constructed or planned.

The Collanac community has worked alongside TECNIDES to manage the project and in the construction, maintenance and use of the water from the collectors. "We have a committee that decides how to share the water we capture, depending on things like who is planning on planting," says Cesar Palacios, the president of La Meseta sector.

Norma Verastegui, a social worker with TECNIDES, has been encouraging different



Cultivation of valuable crops such as prickly pear hold great potential for revenue generation in Peru's impoverished coastal settlements.

forms of community participation in the project. There are some 57 families in the La Meseta sector, migrants from every corner of Peru in flight from economic hardship and the violence sparked by the Shining Path during the past decade. "Their customs are quite different depending on where they are from, which can pose problems when it comes to working together," says Norma Verastegui.

Nonetheless, this diverse community has succeeded in forming womens' and youth clubs. The womens' club is planning to build a community kitchen because it is more economical for them to prepare meals together. They have also begun growing vegetables. It is primarily the women, children and elders who shoulder all the work of gardening and raising livestock. The men leave the community every day to look for work in Lima.

Some families have created productive oases in the dry soil, growing a variety of trees including tara, lúcuma and *Schinus molle*, cultivating fruits and vegetables, and raising chickens and guinea pigs. A portion of the water for the family and community gardens comes from the fog collectors already installed. Until the other collectors are in service, the rest of the water must be purchased from tanker trucks at a cost of about \$US3 per cubic metre.

MAKING EVERY DROP COUNT

Minimizing the amount of water needed for cultivation is the purpose of the second major technology being applied in the project: pottery dispensers that allow just enough water to seep through their porous walls to satisfy the needs of each plant. This technology finds its antecedent in ceramic pots used by the Incas in Peru's arid hills. The modern pottery dispensers are about 6 inches deep, with spouts at each end that allow them to be linked by hose beneath the growing plants.

Dispensers of varying rates of seepage — to match the water needs of different plants — have been designed for TECNIDES by Ernesto Huayta, an engineer specializing in ceramics. They save enormous amounts of water. Based on tests with all the different types of trees involved in the project, "the average amount using this system is 4 litres per month per tree," says Huayta. "This is very little water."

Collanac resident Apolinario Crispín says he uses 60 litres of water per month for each tuna plant when he waters by bucket. But the dispenser system requires a mere



Efficient irrigation systems such as these pottery water dispensers for farming and reforestation could improve the environment of many arid regions.

4 litres of water monthly to do the same job.

"The dispenser system is an important saving of water, which represents income," says Cirilo Vasquez, the president of Collanac community. Once the dispensers go into full-scale production, they will be sold for less than 10 cents each. Although not many residents have bought pottery dispensers, or the tara seedlings (along with other tree species) that the project raises at a community nursery, Vasquez believes more will. "I think with the dispenser system everyone will buy taras. It was a desert when we arrived, but now it is getting better every year — the people are

becoming convinced."

In one dry valley, Leon and Blossier are pursuing experiments to grow tara trees with little or no irrigated water, using various soil mixtures. These experiments also allow them to select the best tara trees: "We have to carry out research to choose the right genetic material for the area that will survive in these difficult conditions," says León.

If the combination of fogcatchers and pottery dispensers proves a success in tuna cultivation and tara afforestation, it is a model of sustainable development that could be adapted to innumerable similar communities along the dry Pacific coast of Peru and Chile and to other countries such as Namibia, Oman and Yemen. Apart from helping improve the incomes of poor rural residents, this system may lead one day to fulfilling a dream of Barbara Leon, one no doubt shared by many Peruvians: a coastal region whose valleys are once again carpeted in green forests. 🌍

NEALE MACMILLAN *in Peru*



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RETURN OF TRADITIONAL DYES IN GUINEA



CTT Normand Jobnville

The textile sector is one of the most important and oldest artisanal industries in Guinea, one whose reputation has spread well beyond the country's borders. But a traditional practice of this industry, using natural indigo as a dye, is disappearing, now to be found only in Foutah Djallon, in the north of the country. Elsewhere, synthetic dyes have come to dominate, because they are easier to use and come in such a wide range of colours.

Morlaye Bangoura, leader of the "Study and Research Project on Guinea's Indigenous Technologies" (PERTEGUI), laments this decline in the use of indigo, the only natural dye found locally. He blames its fate on technological problems. There is no doubt that *Indigofera tinctoria* demands long and complex processing — to make it into a dye bath takes at least seven days, as compared to a few minutes using synthetic colouring agents. But some of the synthetic

dyes are being improperly applied, and they often fail to bond fast to the fibre.

Guinea has many plants besides indigo that could be locally exploited to produce dyes with real customer appeal. This would help reduce imports of dyes that must now be bought at exorbitant prices — a 30 or 40-gram package of dye costs 3,500 FG in Conakry (about CAD\$4.50) and considerably more in the north. Quite apart from the question of dyes, the competitiveness and further expansion of traditional products have been hampered by a general lack of technology and expertise, which explains PERTEGUI's involvement.

Through an IDRC-supported project called "Traditional Dyes," PERTEGUI has succeeded in greatly improving the extraction of natural indigo. Now, the extractive and dying processes require no more than two days, instead of the 8 to 12 days needed before. Indigo is now

being produced in powdered form after a few hours of anaerobic fermentation of the leaves. This is followed by filtration, decanting and drying in the sun. The dye bath can then be made just as easily as with the imported colorants. The research team has already had overtures from foreign buyers interested in procuring the natural dye.

Dyers can now buy powdered indigo on the market, thus avoiding the extraction stage and saving considerable time. Moreover, there has been an eight to ten-fold decrease in solid and liquid wastes from exhausted dye baths, which greatly reduces the environmental impact. Finally, the nauseating fumes produced by the conventional baths have been eliminated, thus improving working conditions.

Researchers have also been able to adapt new printing techniques for use under local conditions. Guinean dyers have long relied exclusively on wooden transfer stamps made by local carpenters, remaining unaware of the alternative method of paper stencils that

Improved techniques for natural dye extraction and printing save money for practitioners of a traditional Guinean industry and could stimulate an export market.

simplifies work with varied designs. The “printing frame” technique is thus another benefit from the project that should be important for the future of Guinea’s dyeing industry.

Another plus for the project has been its cooperation with the University of Conakry’s mechanical engineering department to develop a device for putting a sheen on dyed fabrics. Surveys revealed that much energy and time were being spent polishing fabric by beating it with wooden clubs on a wooden board. At this and other stages of the research, cooperation between PERTEGUI and the Quebec Centre for Textile Technology (CTT) has borne fruit. The Canadians proposed a simple machine that has been in use since the beginning of this century. It consists of a vertical row of wooden mauls that are raised in quick succession by a cam arm — the mauls then fall by the force of gravity and strike the fabric, which is wound around a roller.

The Canadian researchers, led by Normand Jubinville of CTT, have also supplied vital data and developed procedures and equipment suitable to conditions in Guinea. Thus, once IDRC’s involvement is over, the project will be assured of continuity (and will have, for example, essential laboratory analysis equipment).

More experiments are under way to find local products to replace imported ones. These include production of local colorants using other plants that until now have been handled in the traditional manner.

The project has permitted scientists from Guinea to visit traditional dying establishments in Quebec, notably Montreal’s Textile Printing Research and Design Centre (CRDIT). Already, a scholarship student in chemical technology has earned a diploma at the College of St. Hyacinth, and is now in charge of all laboratory and field work, as well as directing practical training for women as dyers.

The work of Guinean dyers is well known all over West Africa and these women have helped train women from neighbouring countries. This regional interest in developments in Guinea and the many characteristics these countries share mean, says Ansoumane Keita, a chemical specialist in dyes, that there are opportunities for technology transfers among them.

Surveys of cooperatives show, however, that despite the progress made in Guinea’s dyeing industry, its profitability remains modest. This is mainly due, says one manager, to competition from textile industries elsewhere in the region and abroad. And yet, the majority of dyers in coastal and central Guinea manage to make enough to survive. In some cities like Kindia, Labe and Male, two out of every three women work at dyeing. The new technologies will now help them to improve the quality and competitiveness of their product and thus reap greater earnings. Dyers would also like to receive training in the production of t-shirts for the local market — currently such articles are imported.

Some women from Mali have learned their trade in Guinea, and are now selling their products there for 3 to 5 times more than Guinea’s own goods. Magire Camara, head of a Guinean cooperative set up in 1962, believes the only way to meet this challenge is to reorganize the sector. Cooperatives are sprouting up everywhere, she says, and what is more, some prefectures have more than a dozen women’s organizations. Whole villages are now specializing in new textile techniques. These cooperatives provide training for unemployed young women, and also give them literacy classes.

It is important to note that more than 95% of those engaged in dyeing in Guinea are women. Some see this work as a supplementary form of income, and others depend on it for their livelihood. For most, as is indeed the case everywhere in the informal sector, the only training they receive is on-the-job.

However determined these dyers may be, though, the fact remains that the country as a whole lacks local expertise in the chemistry and technology of textiles, says researcher Morlaye Bangoura. He is still optimistic, however, thanks to this project, which has helped set up workshops for training in new dyeing and printing techniques. Access to this kind of training could be improved further, as local technical colleges become more committed to providing it. 🌐

ABDOULAYE DIARIO DIALLO *in Guinea*



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CHINESE FARM FORESTRY: NOT JUST TREES IN FIELDS

In 1990, scientists from the Chinese Academy of Forestry (CAF) visited Liuminying, a village south of Beijing, and suggested that the village could increase its meagre tree coverage, then accounting for only 6.1 percent of its land area. The scientists proposed that tree belts be planted in and around the fields, and promised farmers that the greenery would in turn help increase crop yields.

The villagers were provided with Paulownia and willow saplings and taught planting techniques. In 1991, the village of 900 inhabitants and 130 hectares of cultivated lands spent more than 100,000 yuan (CAD\$20,000) and devoted more than 11 percent of its precious land to planting trees.

"At the time I doubted the wisdom of giving up the cropland," recalls Zhang Kuicheng, the village head. But there have been rewards. Today, trees cover about 17.4 percent of the village's land, and even with 10 percent less arable land, Liuminying increased its grain harvest in 1993 by 38 percent over 1990. "We did apply better cultivation methods, but I believe the trees were by far the most important factor for the better harvest, because they protected the crops against wind and sand storms, shed leaves to fertilize the soil and improved the micro-climate," says Zhang.

The successful experiment at Liuminying was just one chapter in a project called "Integrated Research on Farm-Forestry Systems in China," carried out by the CAF with financial aid from IDRC.

"Farm forestry, or agro-forestry, is more than simply planting trees in the fields," says Prof. Zhu Zhaohua of the CAF, who led the project.

Apart from technical research, the project emphasized the social and economic dimensions of the impact of trees on agriculture and farmers' lives.

The project represents the most comprehensive farm-forestry research ever carried out in China. Over a four-year period, CAF organized over 200 scientists specializing in agriculture, forestry and social sciences to collaborate in 15 subsidiary projects. Over 30 experimental sites were established in 12 provinces and municipalities in northern, eastern and southern China.

"The objective was to study how to provide farmers with an effective land management system that would

bring about high farm yields and incomes in a balanced ecological environment," Zhu Zhaohua says. "It has helped overcome a quite common defect of traditional agriculture, which is often characterized by low output at the cost of relatively high investment, resulting in a deteriorating environment."

The project was initially inspired by 15 years of research on Paulownia trees led by Prof. Zhu (see IDRC Reports, Vol. 19, No. 4). Since the mid-1970s, Zhu and his colleagues have studied and spread techniques of interplanting fast-growing Paulownia trees with farm crops on the plains of northern and central China. Under their influence, the crops on over 1.3 million hectares in China have been interplanted with Paulownia.

Paulownia has many desirable qualities. The tree grows tall in only a few years and provides excellent timber for construction and furniture making. Its roots strike deep into the soil, absorbing nutrients in the deeper soil layer without stunting the growth of farm crops in the upper layer.

"In the late 1980s, we noticed that the farm-forestry models using only one tree species could not cope with the varied climatic and soil conditions in different parts of the country," Zhu says. "Hence we proposed to IDRC integrated research on farm-forestry models with many tree species for different geographic regions."

Bamboo shoots and mushrooms are just two of the non-timber forest products being produced and marketed by Chinese farmers

In the broad plains of northern China, scientists focused on interplanting crops with Paulownia or fruit trees in low-yielding fields. At sites in subtropical southeast China, scientists experimented with Chinese

fir, tea, bamboo, fruit trees, Paulownia and other plants to improve soil, reduce erosion and upgrade fields in hilly areas. "Hill slopes account for about 70 percent of the total land area of the subtropical region in China," Zhu Zhaohua says. "Studies in methods of fully utilizing the hilly land are of special importance."

Major efforts were also made to improve the planting system in tropical rubber farms. The Nanhua State Farm in Guangdong Province has a 2,400-hectare rubber farm. It used to rely on 800 hectares of *Acacia richii* trees as wind-breaks to protect the fragile rubber trees from typhoons. However, the *Acacia richii* has little economic value. In

1990, scientists began to replace them with fast-growing eucalyptus, interplanted with rattan. Today, over 41 percent of the shelter belts are replanted with eucalyptus and rattan plants, "which contribute to quite high income for the farm in addition to serving as a more effective defense against strong wind," Zhu says.

The researchers are proud of the practical methodology they have applied in implementing the project, Zhu Zhaohua says. "We call it '3-D methodology,' which is to diagnose, design, and deliver." The researchers first diagnose or investigate the agricultural and ecological systems of a place, as they did at Liuminying. They then design a plan to solve the specific problems of the target zones. When the practice proves successful, they deliver or transfer the technology to places with similar conditions. "Technical extension and transfer are most important. If a research project produces no impact, it means nothing," Zhu says.

An important part of the researchers' agenda was to help farmers produce and market not only typical forest products such as timber and fuelwood, but also what are known as non-timber forest products, such as bamboo shoots, mushrooms and Chinese gallnut.

In the late 1980s, CAF experts taught some 100 peasant families in the mountains at Muchuan County in Sichuan Province how to grow mushrooms in humid and warm forests. 1988 saw a harvest of several hundred tons of fresh mushrooms. But the harvest was too bountiful and processing and storage facilities too rudimentary, leaving heaps of rotting mushrooms.

In the second year, farmers had to abandon 90 percent of the mushroom culture media. In 1990, with the farm-forestry project under way, researchers provided farmers with technology and equipment to make dried mushrooms for easy storage and transport. Today, a plant built in the area makes over 50 tons of dried mushrooms yearly, some of which is exported to Japan. The annual return for local people is estimated at over US\$30,000.

Scientists have also developed and spread the technology of preserving bamboo shoots in Anji County, China's leading bamboo producing area in Zhejiang Province. In 1992, a single village there earned a profit of about



Non-timber forest products — such as the bamboo shoots being processed in this Chinese factory — are a vital component of China's mixed farming and forestry systems.

CAD\$28,000 from the sale of its preserved bamboo shoots.

Upon completion last year of the farm-forestry project, a report issued jointly by the Centre for International Forestry Research, the FAO Asia-Pacific Agroforestry Network, and the Ford Foundation commended the project team for "taking such an inclusive view of its subject, an approach which is rare in forestry research programs anywhere."

Although the project activities are completed, Prof. Zhu believes the research will continue to have wide significance. "Although the particular method in some subsidiary projects cannot be copied elsewhere, the general approach and some models can be widely adopted in other places in China, even in other developing countries. ⑥ ZHANG DAN *in Beijing*



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CASHEW APPLE JUICE, ANYONE?

Imagine a fruit half-way between an apple and a pear, with a nut attached to its base. This curious work of nature is the cashew apple. Since the early 1980s, it has been widely cultivated in Vietnam — but only for its cashew nut.

The cashew apple itself is left behind to rot when the nut is harvested, despite the fact that the fruit is five to ten times richer in Vitamin C than an orange. Why such waste, when there is growing demand for exotic and healthful fruit juices?

The problem is that the cashew apple has an extreme astringency that puckers up your mouth and makes the juice undrinkable. Furthermore, the fruit bruises easily and spoils quickly from bacterial action.

Now, however, a research team in Vietnam's Ho Chi Minh City and a Quebec company, Lassonde Technologie of Rougemont, think they have the answer to this double jeopardy. Thanks to IDRC support, the partners hope their efforts will lead to commercial production of cashew apple juice within two years.

"Extracting juice from cashew fruit by heating and pressing it is no more difficult than making ordinary apple juice," explains Richard Couture, the chief researcher for the project at Lassonde Technologie. The problem is getting rid of the astringency — the focus of the researchers' work. The chemicals that cause this effect are polyphenols, which are rather like the tannin found in wine. The company has already had some success testing different techniques in a pilot project and, says Dr. Couture, "we are quite hopeful that we can develop a viable industrial-scale process for eliminating the astringency."

On the Vietnamese side, Dr. Nguyen Xich Lien of the Polytechnical University of HCM City leads a multidisciplinary team of scientists from several Vietnamese research centres. Dr. Pham Thanh Binh of Thu Duc University of Agriculture and Forestry, for example, is responsible for socio-economic aspects of the work.

The project promises significant social and economic benefits, especially for the farmers who grow the fruit and the workers (mainly women) who harvest it. With little

additional effort and expense, these people could see their income rise substantially, if this previous waste by-product becomes a highly marketable commodity.

There is already a factory in the area, belonging to DONA Fruit Canning, which could easily be converted to handle the local cashew apples before they spoil. Transportation and processing of this new raw material will create several hundred jobs and generate sizable new revenues for the company. An environmental impact assessment of the

project is to be carried out by Dr. Tran Ung Long of the Institute of Tropical Technology and Environmental Protection. Any such impact is expected to be minor, since the process requires only simple techniques and few chemicals. A researcher at the Institute of Agricultural Sciences of South Vietnam, Dr. Nguyen Nghi, is even planning to experiment with drying the cashew apple pulp left from the pressing process, for use as livestock feed.

The research agreement calls for several exchanges between Vietnamese and Quebec scientists. Already one Vietnamese student has been at Laval University since last

September working on his Master's degree. For his thesis on cashew apple juice, he will conduct experimental work at Lassonde Technologie and at Agriculture Canada's Centre for Food Research and Development at St. Hyacinth, Quebec. 🌐

BRUNO DUBUC *in Montreal*



IDRC: Jean-Marc Fleury

Efforts by Vietnamese researchers to eliminate the astringency of cashew apple juice promise to create a valuable commodity from a waste product and improve rural farm incomes.



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DIVERSITY, GLOBALIZATION, AND THE WAYS OF NATURE

by Danilo Anton



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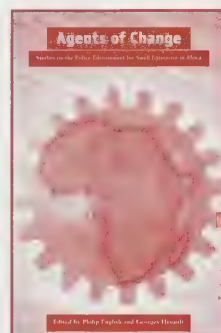
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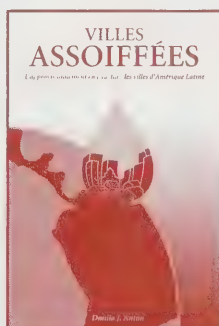
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VILLES ASSOIFFÉES

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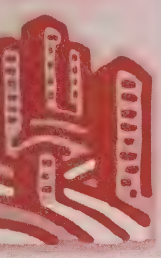
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MAINTAINING FOOD RESOURCES IN ECUADOR'S HIGHLANDS

Ecuador's Andean highlands is a fragile ecosystem prone to drought, and heavy frosts and soil erosion, which compromises food crop production. A high proportion of residents suffer chronic food and income insecurity. Malnutrition is widespread: 52% of children under five suffer protein-energy malnutrition, 28% suffer riboflavin deficiency and 25% suffer iron deficiency.

The search to improve agricultural productivity has led the Ecuadorian National Institute for Agricultural and Livestock Research (INIAP) to focus its research on a precious local resource — the ancient crops of the Andes. These indigenous foods, which include quinoa, amaranth, lupins and various roots and tubers, are a significant source of protein, calories, vitamins and minerals. The crops are well adapted to mountainous climates, may be cultivated with few inputs and are drought- and frost-tolerant, thereby protecting against food insecurity when traditional market crops such as barley and potatoes produce insufficient yields.

One of the most promising Andean crops is quinoa (*Chenopodium quinoa Willd*), formerly a staple of the Incan diet but displaced by barley and wheat following the Spanish conquest. Abundant in nutrients including lysine-rich protein, vitamin E, folic acid and iron, quinoa is enjoying increased demand in Ecuador and beyond.

With IDRC support during the 1980s, INIAP research on quinoa and other Andean crops emphasized improved varieties, better machinery to produce and process quinoa; and the marketing and consumption of quinoa. A decade later, the research has turned to the communities themselves to truly understand the quinoa food system in all its agricultural, social and economic aspects.

The most recent project sought to integrate research on production, processing and marketing of quinoa through a community-based small enterprise. This business was launched in Guamote, Chimborazo, jointly by INIAP and the Union of Indigenous Communities of Guamote (UCIG). Guamote was considered an ideal test site: the soil erosion, deforestation, climatic uncertainty and extreme poverty make agricultural and income-generating alternatives an urgent necessity.

dehulling quinoa, and market studies.

But the most significant result is the creation of "Agroindustrial ICU," a successful small enterprise now two years old, cooperatively owned and managed by 28 indigenous communities who share profits. Production of quinoa and other grains is financed through a revolving credit fund. The enterprise purchases the grains and

classifies, cleans, dehulls, mills, packages and markets value-added products. The plant is run by community members who receive hands-on training in agricultural production, the operation of processing equipment and business administration. Guamote's indigenous people now "feel they are controlling their own destiny," explains Eliseo Guznay, President of ICU's steering committee.

"The main benefits are training," reports Maria Custodia Lama, accountant at the pilot plant. "The project is helping communities to improve themselves." Other benefits for the 2,000 families in ICU's member communities include labour savings for

both men and women, and stronger local women's organizations. For Carlos Vimos, project manager, "the most significant impact is the increased production of quinoa in the region." Quinoa-producing families report keeping about one-third of the produce for their own consumption, which represents potential increased intake of protein, vitamins and minerals.

INIAP's experience both in working with indigenous grassroots organizations and looking at food systems systematically to target weak links from production to consumption, breaks important ground in research for development. The knowledge gained could be used not only to produce quinoa in other high-risk regions, but also to develop new small enterprises and strengthen indigenous organizations elsewhere. **BARBARA MACDONALD, CARLOS NIETO, AND CARLOS VIMOS** in Ecuador



Residents of Ecuador's Andean highlands foresee better nutrition, small enterprise development and higher incomes from production of quinoa and other ancient crops.



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COMPUTER NETWORKS: A DEMOCRATIC TOOL FOR NGOS

Rapid advances in communications technology may help improve the South's access to information.

Every day, thousands of NGOs from all over the world trade information, ideas and rumours on hundreds of subjects ranging from human rights and debt to tropical rainforests. Each electronic conversation, which can involve an unlimited number of people, occurs over computer networks capable of transmitting several pages of text anywhere on earth at a fraction of the cost of making a telephone call at off-peak hours.

Five years ago, exchanges of this kind were unthinkable — at least for NGOs operating in parts of Africa. But thanks to rapid advances in communications technology, the possibilities for groups throughout the developing world to communicate affordably have improved dramatically.

The heart of this revolution is the modem, a device that connects computers to telephone lines, and is now available for about US\$100. For a growing number of Southern users, a desktop computer and modem are now considered essential in the struggle for social justice, sustainable development, and participatory democracy.

"We have no doubt that the potential of modern communication technology is tremendous," states K.K. Krishnakumar, a founding member of the All India People's Science Network and the Indian Society for Knowledge & Science. For



IDRC Claude Dupuis

example, computer networks could be used to improve the South's access to information about education, literacy programs, health, appropriate technology and the environment, he says.

Krishnakumar was among the speakers at an IDRC-sponsored workshop on computer networks and international development organized last year by Nouvelles Solidarités, a consortium of Quebec NGOs involved in information and communication issues. The Ottawa workshop was designed to raise awareness about operating information networks in the South, and develop links between NGOs of the North and South active in communications.

According to Roberto Bissio, Executive Director of the Third World Institute in Montevideo, Uruguay, one of the advantages of

Sri Lanka. The opinions of grassroots community organizations can be heard as easily as those of large global institutions in an electronic debate carried by computer network.

computer networks is their democratic character. In an electronic debate, the opinion of a large global institution bears no more weight than that of a small grassroots group.

INSTANT RESPONSE

"Without the cosmetic attraction of glossy paper or full-colour printing, only the weight of the argument will make a difference for the readers. Based in any part of the world, they will get both at the same time, and have the opportunity to voice their own comments instantly," he wrote in a paper presented at the workshop.

One of the more memorable debates occurred last year in response to an announcement by US President Bill Clinton that he intended to sign the convention on biodiversity, which had been drafted at the 1992 Earth Summit in Rio de Janeiro. Two days later, a draft copy of the US President's "interpretative statement" on the convention fell into the hands of Vandana Shiva, an environmental activist in India. To Shiva, the US

position threatened to "hijack the convention for the benefit of industry, making it an instrument to be used against the Third World." She alerted the Third World Network's Malaysian office, which posted her message on various computer bulletin boards used by environmental groups. Within minutes, NGOs from around the world were sending faxes and e-mail protests directly to the White House.

"A few years ago, environmental scholars and campaigners in the South would only know about the discussion after it was over," noted Bissio, "and their comments and critiques would never make their way back to global decision-making circles in time to be taken into consideration."

The NGO community started building a global communications network around ten years ago. At first, NGOs relied on commercial systems to exchange information locally or regionally. By 1985, many groups were pooling resources to build their own networks around powerful microcomputers. These pioneering systems included PeaceNet and EcoNet in the United States, and GreenNet in the United Kingdom.

In 1988, a formal link was established between GreenNet and the California-based Institute for Global Communications, which manages both PeaceNet and EcoNet. This initiative led two years later to the Association for Progressive Communications (APC), an international cooperative set up to foster the development of national communications systems through technical and logistical support.

Today, the APC network operates 24 hours a day and serves 17,000 organizations and people in 95 countries. It also provides links to other communications networks, such as the Internet, and to small systems in Africa and Asia, says Carlos Alberto Afonso, head of AlterNex, which serves as the official Brazilian

"node" or information gateway on the APC network.

For Brazilian NGOs, all it takes is a computer, modem and telephone line to send or receive e-mail messages or participate in an on-line conference over the APC network, says Afonso. All international traffic flows through the AlterNex node, which is automatically interconnected with other nodes in the network.

Despite such progress, computer networks are at a relatively early stage of development throughout the South. According to Bissio, "the North-South gap in the access to this technology is even greater than in the distribution of other resources." For example, the number of e-mail users worldwide is in the tens of millions, of whom only a few thousand are based in Latin America or Africa.

FILLING IN THE GAPS

In Asia, IDRC supports the Pan Asia Networking Program (PAN), which promotes research collaboration through information access, use and sharing. In Africa, where reliable telephone service cannot be taken for granted, IDRC has been spearheading efforts to extend the user base through the development of an international constellation of national inter-linked networks connecting NGOs, universities and governments. It now consists of more than 12 nodes serving several thousand user groups across the continent. The goal is to install a node in every country. To achieve this, "we are looking for new donors who are willing to finance the development of a node," says Doug Rigby, a communications consultant for the Environment Liaison Centre International in Nairobi, Kenya.

According to Rigby, the cost of creating a node has come down and currently ranges from CDN\$10,000 to \$12,000, including equipment and operator training. Each node has the potential to support 100 to 200 user groups on a self-sustaining basis.

Most operator candidates require at least a few days of training before they are ready to use the network, Rigby says.

For established nodes in developing countries, the principal concern is paying for telephone services, which are generally about 10 times more expensive than in North America. Due to the present structure of international networking (Internet) and billing regimes, African nodes end up paying for both incoming and outgoing network traffic, including unwanted e-mail from the North that they can neither prevent nor control. This problem will get worse if a growing number of users on the Internet network takes an interest in Southern addresses, warns Rigby. Possible solutions include a surcharge for Northern users when sending e-mail to African addresses, sharing leased lines, and editing the volume of information in electronic conferences, says Rigby.

Whatever progress is made on these and other questions of electronic communications, the global NGO community promises to continue its leadership role in advancing access to affordable networking services even in the least developed countries. ☉

JOHN EBERLEE *in Ottawa*



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POWER AND INEQUALITY INSIDE THE FAVELA

In 1940, about 70% of the Brazilian population lived in a rural environment. Fifty years later, the situation has turned around completely. Today, few cities escape the problems caused by massive growth on their outskirts.

In 1988, a sanitary engineer conducted a research project in nine "favelas" (peri-urban shantytowns) in the city of Salvador, the old Bahia, located on the west coast of Brazil. Luis Roberto Moraes, a professor in the Hydraulics and Sanitation Department of the Federal University of Bahia, wanted to assess the incidence of diarrhoea, parasitic diseases and infant mortality in children below the age of five. He made some astounding discoveries.

Although these societies appear to be homogenous, Moraes encountered a micro-society where there is no equality among the poor, and where social distinctions and power relationships are an integral element of daily life. In short, these communities mirror larger urban structures on a small scale.

Moraes discovered that the majority of favela residents were poor and illiterate and originally came from rural areas; nevertheless, there were also those who were richer than others and who owned a number of small businesses and many houses. Since these houses were built in the best locations on cultivated slopes, they were not at risk from floods or erosion. If every house had a television antenna on its roof, those belonging to "rich families" were also protected against theft by grillwork on their



IDRC Denis Marchand

Health research demonstrates links between health and environment and the value of community and government participation.

doors and windows, just as is the case in more affluent residential areas. Their children attended schools, properly clad. Moraes was also surprised to come across professional people in the favelas who wanted to avoid paying too much rent downtown.

THE HEALTH SITUATION

The major objective of the research work was to compare the health situation of residents who used the available sanitation services. Moraes was able to determine that, in communities where the provision of clean water involved community participation, the residents' quality of life improved in a sustainable fashion. He concluded from this that cleaning

In urban shantytown communities where residents participate in the provision of clean water, the quality of life can be improved in a sustainable fashion.

up the environment resulted in a clear improvement in health and a real decline in the death rate and infant mortality.

The Federal University of Bahia followed up this research with an intervention project, whose purpose was to improve the health of residents in a district completely lacking in water and sewer services. This project brought together a number of stakeholders, representing the federal university, the community itself and three levels of government representing Brazil,

the province of Bahia and the city. The specialists were drawn from the sectors of health, social action, water resources, health, housing and social welfare.

"Urbanizing a favela is a very complex process" says Moraes, "particularly if this initiative depends on community participation and integrating the work of many departments during all the implementation phases: identification of problems and solutions, planning and implementing the work, and management and maintenance of infrastructures. It is, however, possible!"

Salvador has more than two hundred communities that have developed in a disorganized and anarchic manner on unoccupied marginal lands on its outskirts. For the most part, these favelas lack essential services such as drinking water, sewers and garbage collection.

The shanty town of Camarajipe, located on a hillside on the banks of the Rio Camarajipe, has a population of 3,500; it has 560 houses, and it has an open sewer; however, for more than a year, an action committee consisting of engineers, sociologists and nutritionists has developed a comprehensive project that involves draining the valley and constructing a sewer network and a water pipe system, building 125 new houses and improving 240 others, installing showers, toilets, wash tubs and water cisterns in 500 residences, as well as a waste collection and treatment system. Schools, daycare centres and health centres will also be built.

A NEW APPROACH

The integration of three levels of government, as well as the total and complete participation of the future beneficiaries, is absolutely key to the project. "However, working together to improve the environment, as well as the health and quality of life of a community, is no easy matter in Brazil," notes Moraes. "Cooperation is not part of our culture; it is a relatively new phenomenon. Institutions and departments are not used to working together and attitudes do not change overnight. Bringing the stakeholders together is one thing; analyzing problems in their entirety is quite another. Finding a solution acceptable to all and one which brings benefits to all requires time, energy, and high levels of strength and conviction."

After what seemed like a constant battle, progress has been made in a number of areas over the past five years. The technical component of the project has been approved, as well as a grant of \$US1.9 million by the federal Ministry of Welfare.

Although the involvement of the favela residents is the project's strong



IDRC Denis Marchand

Bringing together all the stakeholders necessary to improve health conditions in Brazil's shantytowns, such as this one in Salvador, requires time, energy, and strength of conviction.

point, the quality of the relationship among the stakeholders is also of major importance. The cross-sectoral approach has encouraged information exchanges on the project's character and its technical components in the social, sanitation, financial and environmental areas. For Moraes, this cooperative process is the first step towards a transfer of technology that will allow the community itself to take on the maintenance and operation of the equipment.

To be absolutely certain that the population has completely grasped the project's objectives, as well as to measure the impacts of its commitment to the success of the work to be undertaken, the University of Bahia is offering community members a training program. For more than a year, twenty or more individuals have been attending weekly courses in community organization and education, assuming responsibility and concepts of health and hygiene. The aim of this university initiative is to develop social, environmental and political awareness, while preventing the development of any form of dependence on the charitable organizations or the State.

UNCONQUERABLE POWER STRUCTURES

Politicians, decision-makers, university staff and public servants have all profited from these contacts with a world which was unfamiliar, or even unknown, to them. They recognize, as a result, that they must respect existing power structures that are hidden but unconquerable, and become involved in lengthy negotiations.

This is the case, for example, in the distribution of property rights on lands occupied by squatters. If the city is ready to grant one lot per family, the owners of two or three houses will claim the number of lots that they already own. The other families will refuse to take a stand for fear of reprisals. Even when the most dynamic leaders are convinced that this concession by the city is soundly based, they will remain silent. "I have two children and I want my family to survive," one of them says. People are well aware of the threat posed by those who want to maintain their privileges.

However, Moraes concludes: "This evaluation of a cooperative process sheds useful light on the situation and will lead to a needed reconsideration of urbanization projects for favelas in the outlying areas. Offering water, sewer, housing, schools, health, and garbage collection services is a basic necessity, although it is difficult to achieve in the current economic situation. But ensuring the sustainability of the improvements and their viability remains a challenge. It is, nevertheless, both possible and desirable!"

DENIS MARCHAND *in Brazil*



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COMBATTING LEISHMANIASIS IN INDIA

It is dry and hot on the dusty main street of Hassanpur village in Bihar, Northeastern India. Dr. L.S. Prasad, known throughout the state as “Dr. Lala,” is beginning to sweat in the 43°C heat. For an hour he has sat in the centre of the village and examined twelve patients while over a hundred villagers watched.

The patients are mostly children. Dr. Lala is checking for a swollen spleen, a darkening of the skin, and fever. These are signs of visceral leishmaniasis: one of the most debilitating illnesses that regularly affects residents in this region.

Epidemics in 1992 of visceral leishmaniasis (VL) or “Kala-Azar” (Black Fever), as it is commonly known in Hindi, killed more than 100,000 people in India and Sudan. VL infects the body, breaking down the various organ systems such as the spleen, bone marrow, liver, lymph nodes and skin. It invariably causes death if left untreated.

Leishmaniasis is, however, not always fatal. There are two other major forms: cutaneous leishmaniasis (CL) and mucocutaneous leishmaniasis (MCL). CL produces skin lesions, both chronic and self-healing. MCL tends to invade the mucous membrane of the upper respiratory tract, destroying the soft mucocutaneous tissue of the nose and mouth, thus resulting in gross mutilation and disfiguration. All three forms of leishmaniasis cause fever, an enlarged abdomen, general weakness, headaches and dizziness, weight loss, sweating and diarrhoea.

The leishmaniasis are a group of insect-transmitted parasitic diseases that are among the most misunderstood and least studied of endemic diseases. Three parasitic species are the primary

Creating a better understanding of the causes of leishmaniasis and the most effective responses to it.

culprits: *Leishmania donovani*, *L. tropica*, and *L. braziliensis*, which lead to the visceral, cutaneous, and mucocutaneous forms of leishmaniasis respectively. Lately, these parasites are known to have divided into several closely related subspecies and strains, complicating both the study and treatment of the diseases.

The parasites are transmitted mainly by the bites of *Phlebotomus* and *Lutzomyia* sandflies. These insects — about half the size of a mosquito — are in turn infected either from people or, more frequently, from domestic or wild rodents, dogs and other mammals. Person-to-person transmission of the diseases is now known to occur in some areas of India and Bangladesh, but it is usually animals that help spread the diseases.

Leishmaniasis often affects the poorest towns and villages, which are usually distant from schools and hospitals and thus tend to receive only minimal attention. As well, areas hardest hit by visceral leishmaniasis infections commonly overlap with endemic malaria regions, possibly leading to underestimates of the importance of VL. People with cases of CL and MCL often try to hide their scars and disfigurations rather than seek treatment.

This kind of behaviour heightens the invisibility of leishmaniasis as a major public health concern. Although worldwide cases have surpassed 12 million, it remains largely unknown. The number of new cases officially reported annually is about 300,000 for CL and MCL, and 90,000 for VL. However, the World Health Organization estimates the

true annual number of cases at about one million.

In developing nations, leishmaniasis causes not only individual suffering,

it also contributes to higher unemployment, lower productivity and added health-care costs. Therefore, leishmaniasis is both a biomedical issue and a serious development one.

Since 1986, IDRC has supported various programs to combat this illness. The Centre has made a concerted effort through workshops, exchanges and community-based research in ten countries to generate information for the prevention and control of leishmaniasis. This initiative has grown into an information sharing network that links researchers and promotes environmentally sustainable solutions based on full community participation.

Thus Dr. Lala does not, figuratively, sit alone. He heads a joint project between IDRC and the Rajendra Memorial Research Institute of Medical Sciences (RMRI) — a division of the Indian Council for Medical Research — that studies leishmaniasis transmission in Bihar and aims to develop sustainable control strategies through community mediated approaches.

As Dr. Lala examines villagers, another member of the research team, Dr. Archana Sinha, head of the Department of Sociology at Patna University, seeks out shy villagers in Hassanpur who may have, or be carrying, the disease. Some she leads back to Dr. Lala. In other cases, she records their medical histories or simply listens to their fears and needs. It is a long process, but Dr. Sinha notes: “This is our first visit to this village. In other places, they see us and come running with their children. It takes



IDRC: Stephanie Colvey

Fighting leishmaniasis in India's poor towns and villages requires developing sustainable control strategies that educate and involve community members.

time to build up their trust....That's my job here."

Dr. Sinha adds, "I must stress that it is important to recognize that these people are not stupid. They may be illiterate, but they are wise to the problems their communities face. The challenge for us is to explain how this disease works and give practical suggestions on how to fight it."

To reach out to these communities a variety of posters, drawings and information in simple language is distributed. Consultation with village elders and local medical staff is standard practice before the team approaches a village. Because the aim is to change people's understanding and attitudes about the disease, the first visit is crucial in creating the right impression. Therefore, it always proceeds with the participation of village leaders.

Creating a better understanding of the causes of leishmaniasis and the most effective responses to the disease is not always an easy task. Dr. Mahabir Das, assistant director of the

project, relates that "during the last leishmaniasis epidemic in Bihar in 1992, people in a nearby village held a ceremony to counteract the disease: they sacrificed a goat to the goddess Kali." Clearly, he adds, more work needs to be done in terms of improving people's understanding and behaviour or the material conditions of their existence that might have a direct bearing on their susceptibility to leishmaniasis.

The national and state governments have not always been forthcoming with assistance. Despite recommendations from Dr. Das and others as early as 1987 that extra funding for more staff, medicines, studies and an increase in insecticide spraying was necessary to prevent the predicted epidemic of leishmaniasis, the government's response was sporadic at best. The cost of such a program was simply too burdensome.

The need for a long-term, community-supported solution thus became an urgent one. Dr. Lala, because of his

reputation in the state, and his vast experience (over fifty years) in treating and researching leishmaniasis, was considered the natural choice to assemble a team that would organize this new approach. He also seems to have a boundless energy; in spite of his 81 years, it is quite common for him to put in twelve-hour days at his clinic and at the RMRI lab, seven days a week.

"We must work hard," states Dr. Lala. "This disease has a long history in this part of the world and I have seen too many people suffer. If we can bring all the elements together, and I believe we have made a good start, we can eradicate Kala-Azar."

Indeed, watching the efforts of this team of researchers in villages like Hassanpur, it is possible to believe that with the continuing support this project has engendered, leishmaniasis could one day be eradicated from all villages in Bihar. 🌐

JOHN RAMLOCHAND *in India*



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PATENTS ON LIFE FORMS: BIO-PIRACY?

The stakes are high in the debate on intellectual property rights and patent protection for life forms. The rights of indigenous peoples and farmers in countries in the South, where most of the important food crops were developed, are under potential threat. Powerful companies in industrialized countries are busy patenting indigenous knowledge built up over generations by farmers in developing countries, a practice some people describe as "bio-piracy." Global policy is emerging almost inadvertently through the patent system, the activities of the biotech industry and court decisions. The issues involved are no longer strictly technical, but ones that have broad social implications.

A new book entitled *People, Plants and Patents: The impact of intellectual property on trade, plant diversity, and rural society*, does not attempt to reach a consensus on these issues. Rather, it is an effort to "identify trends, concerns and opportunities on intellectual property issues relevant to plant breeding and plant genetic resources."

However, the authors, known as the "Crucible Group" (an international team representing a broad range of interest groups and Southern and Northern countries) do make some strong recommendations. They call upon the United Nations to convene an international conference on society and innovation, "bearing in mind that some people, countries and cultures have deep ethical concerns about biotechnology and the concept of life patenting."

Certainly, there was no agreement among the panelists at an IDRC Forum held last year in Ottawa to discuss the question, "The GATT

agreement, biodiversity, and intellectual property: Who wins, who loses?" The discussion ranged from the inclusion of trade related international property rights (TRIPS) in the recent General

How can the rights of poor countries be protected amid legal battles over patent protection, intellectual property rights?

Agreement on Tariffs and Trade, to the ethics of patenting life forms.

The patent system for dealing with plant and animal genetics is badly out of order, according to Pat Mooney, one of the forum panelists. Mooney is executive director of Rural Advancement Foundation International (RAFI) and a long-time critic of patent protection for biological material.

He believes the most serious fault with the current system is its inability to acknowledge and work with the indigenous knowledge base. "We need to pursue a system that directs the benefits to the innovators in the developing countries."

Geoff Hawtin, a British-Canadian plant breeder who heads the International Plant Genetic Resource Institute in Rome, argued that the TRIPS clause of GATT fails to protect the biodiversity of the developing countries. Companies have moved from patenting a specific gene in a plant to patenting genetic manipulation of a whole species. He argued that the patent system was never intended to be used for life forms. Some patents have been granted that actually prevent farmers from planting their own seed, he noted.

Hawtin said there is little evidence that patent protection stimulates innovation in this field. Most of the great agricultural advances in the

world came about without any patent protection. But with plant breeding being protected by the large agricultural companies, most of the research effort is being put into developing herbicide-resistant crops instead of biological controls.

On the other hand, Marta Gutierrez of the National Agricultural Technology Institute in

Argentina argued that patents could be an acceptable way to access technology. She said agriculture in her country strives to operate in a fully competitive atmosphere and that the GATT framework on intellectual property could benefit the industry.

Argentina recognizes biodiversity as the assurance of the future of the agriculture industry, said Gutierrez. It will not deal with anyone who does not abide by the Convention on Biological Diversity.

Professor Anil Gupta of the Indian Institute of Management said intellectual property rights can be useful, but a system that better incorporates the needs of developing countries is required. Indigenous people, whose contribution to biological diversity has been extremely important, should benefit from the knowledge they have accumulated over generations.

Indigenous knowledge has not just been passed intact from generation to generation, it has also been modified at each step through the years. In Gupta's view, biodiversity is being lost in the developing world for a variety of reasons, including economic and environmental factors. Poor, illiterate farmers lack incentives to preserve the old ways. "If we have to preserve biodiversity by keeping people poor, that is a poor choice to make," he said.

Gupta's concern is that the

developing countries do not have adequate institutions to manage intellectual property rights and cannot afford the high costs of processing patent applications or fighting challenges in court. Therefore, more patent laws could actually weaken the position of developing countries.

The TRIPS clause of GATT would work if companies were obliged to prove that they had taken genetic material from developing countries lawfully and contractually and that they were prepared to share the benefits equitably with all countries.

Gupta said the developing countries have been promised negotiations for access to new technology in return for the use of the biodiversity they have produced. But the system fails because the responsibility of the consumers has not been identified. Consumers refuse to pay any compensation to the producers of biodiversity.

Pat Mooney argued that the current patent system is too far gone to correct itself and called for a new convention to completely restructure intellectual property rights. He cited examples of large corporations applying for and receiving patents for biological material obtained from developing countries. Mooney described how US firms have patented naturally coloured cotton developed by farmers in Peru and other Latin American countries hundreds of years ago, and how a Texas company has patented a rice variety developed in the



Rice paddy, China. *People, Plants and Patents* debates whether plant varieties developed and modified by local farmers over centuries should be subject to patent protection by large corporations.

Philippines by the International Rice Research Institute. He suggested IRRI is afraid to challenge the patent because it depends on US funds.

To those who suggest that developing countries can ignore the GATT provisions, Mooney noted that legislation now before the US Congress would tie US aid to how quickly the recipient countries adopt the GATT/TRIP rules. He criticized a system that allows companies to patent blood cells of aboriginal people from the Solomon Islands or to patent thousands of DNA fragments from the human brain.

Pat Mooney and Geoff Hawtin are both members of the Crucible Group and thus are two of the authors of *People, Plants, and Patents*. The book offers no simple remedies, but tries to steer a course through the maze of questions. On the most contentious issues, it offers three different viewpoints for argument, discussion and further research. It also presents a series of recommendations that, if followed, could help a government

design a rational and workable national program.

Although *People, Plants, and Patents* leaves certain questions open to discussion, it is united on two fundamental points: people in the countries with a rich heritage of biodiversity should be allowed to benefit from that heritage; and intellectual property rights should encourage innovation that benefits everyone and promotes conservation of genetic diversity. 🌐

HENRY F. HEALD in Ottawa.

IDRC Book

People, Plants, and Patents: The impact of intellectual property on trade, plant biodiversity and rural society by the Crucible Group. IDRC 1994, ca 100 pp., ISBN 0-88936-725-6, CA\$12.95 (Also available in French and Spanish.) To order: Internet: order@idrc.ca

GRASSROOTS INDICATORS FOR SUSTAINABLE DEVELOPMENT

A Kenyan farmer pulls a plant from the dry, cracked soil. Shaking away the soil, she examines the roots and predicts that the short rains will come soon, perhaps by month's end. In Bhutan, pastoralists alternate herds of yak and cattle between northern and southern pastures according to the seasonal flowering of a local shrub, a crucial practice for the regeneration of pasture and for the prevention of disease transmission between the two species. In northern Canada, aboriginal men and women discuss changes in the concentration of effluent in local rivers from pulp and paper processing. Their assessment of water quality is based on variations in the taste of fish.

All over the world, examples such as these can be found of local people using "grassroots indicators"; measures or signals of environmental quality and change formulated by individuals, households and communities, and derived from their local systems of observation, practice and indigenous knowledge. Since "the environment" is defined here in its widest sense to cross economic, social, cultural and ecological boundaries, grassroots indicators may be better gauges of well-being than traditional development indicators that are confined to sectors such as health, education or the economy.

The central importance of grassroots indicators is as pieces of information that local people use to make decisions based on observed trends, or to judge how close they are to specific goals. They are instrumental in local monitoring of ecosystems, evaluating and predicting environmental change, as well as in decisions whether to work toward sustainable and equitable development.



IDRC Denis Marchand

FIRST NATIONS ENVIRONMENTAL INDICATORS

Canada's indigenous peoples, known as the First Nations, have a long, informal experience with grassroots indicators. Traditionally, they have depended upon renewable resources (agriculture, hunting and fishing) that they have managed sustainably for hundreds of years. Their livelihood and very existence has often been threatened by unsustainable development manifested in water pollution, deforestation, and declines in fish and wildlife. Now, First Nations suggest they are lacking structured, formal analysis of these environmental changes to enable communities to assess the damage done, identify their causes and slow down or reverse harmful trends.

Henry Lickers of the Mohawk Council of Akwesasne in Ontario is the lead investigator of the IDRC-supported project "First Nations Environmental Knowledge and Approaches to Natural Resources." He argues that environmental indicators can significantly improve a community's analysis and evaluation of

Mexico. Grassroots indicators formulated from local knowledge systems permit communities to monitor environmental change that could affect activities such as livestock management.

local change. Environmental indicators can help preserve existing First Nations knowledge of sustainable resource use and, most importantly, strengthen traditional rights, including a decisive role for First Nations in formulating local resource management policies.

Interestingly, for First Nations people, indicators of environmental decline simultaneously uncover links to social violence and declining health standards. At an IDRC Grassroots Indicators Workshop, held in Ottawa in late 1993, Henry Lickers provided a unique example of such a grassroots indicator: changes in the number of women who preserve food as a measure of domestic and social security. Women preserve fruits, vegetables, meat and fish when they feel assured of social and domestic stability. Lickers defined domestic stability in terms of lack of domestic violence and addictive behaviour as well as economic well-being.

INDIGENOUS KNOWLEDGE AND INNOVATIONS

The Society for Research and Initiatives for Sustainable Technologies (SRISTI), an IDRC-supported NGO in Ahmedabad, India, documents indigenous innovations and exchanges information through its network and newsletter known as "Honey Bee." This network draws its operating principles from the behaviour of the honey bee: just as the bee collects pollen without making the flower poorer, knowledge should be shared without depriving its owners. The network also encourages a cross-fertilization of ideas among innovators.

For SRISTI Chairperson Anil Gupta, environmental indicators

are intrinsic to systems of indigenous knowledge and technological innovation. Local land users have rigorously explored and tested environmental indicators through generations of adaptation. The key for research in this subject area is, therefore, to compare and test Western scientific concepts against grassroots indicators to "add value" to local knowledge.

One example of how SRISTI is tackling this objective is to study the taxonomic basis of indigenous knowledge systems. Local ecological classification systems, from cloud formation to soil type, are compared to formal scientific taxonomies. This work is not only important in identifying and potentially using grassroots indicators, but also in restoring appreciation for the richness and values of local culture. Bringing this awareness to research agendas in universities, development programs, and extension services is SRISTI's next challenge.

MOVING GRASSROOTS INDICATORS INTO THE MAINSTREAM

Clearly, the challenge of integrating grassroots indicators into decision making is two-fold: how to make them more acceptable within current decision-making processes and how to make these processes more receptive to grassroots indicators. These twin challenges are the foundation of a special IDRC activity that supports research to evaluate the potential for identifying and utilizing grassroots indicators.

Currently, there exists little published material directly relevant to grassroots indicators. The most impressive material is "grey literature," consisting mainly of research proposals. Almost nothing exists on

how grassroots indicators may actually feed into national environmental planning and policy design or reporting systems.

Given this information vacuum, two outcomes of IDRC's 1993 workshop on grassroots indicators are particularly important: the formation of the Grassroots Indicators Network (GRIN) and the drafting of a Protocol for Research and Networking Activities on Grassroots Indicators. In essence, the protocol states that research on grassroots indicators should be controlled by local communities, should address needs and priorities identified by communities themselves, and research results should first be shared with the source individual or community before any wider diffusion occurs.

In the follow-up to the workshop, two key subject areas were proposed for IDRC support: early signals of ecosystem stress or change; and community adaptation to environmental change.

Already, relevant project activities have been identified. Some are specifically related to grassroots indicators, such as "Community Resource Mapping for Policy Analysis in the Central American Hillside," a collaborative project between the Escuela Agrícola Panamericana de Zamorano in Honduras and the International Food Policy Research Institute. Other projects have a sub-component on grassroots indicators, such as the Ugandan Fisheries Research Institute's "Lake Victoria and Nile Basin Management Research Project."

Beyond these two examples, IDRC, in cooperation with the Grassroots Indicators Network, is ready to support a range of activities in order to stimulate ideas and documentation on grassroots indicators as

LINKING GRASSROOTS INDICATORS TO NATIONAL REPORTING SYSTEMS

Certain initiatives are overcoming the obstacle of finding ways to incorporate grassroots indicators into environmental reporting systems. In Rijnmond, Netherlands, people telephone a central "hotline" number run by the Environmental Monitoring Centre to report noise and air pollution based on what they smell, see and hear. Periodic tallies of these reports are then passed on to public authorities. Data from the grassroots indicators of pollution can then be compared and synthesized with official data from the national environmental services.

Similarly, in Ontario, Canada, telephone hotlines are operated by provincial authorities, often with the participation of community groups, for monitoring invading plant species and sightings of endangered birds and animals. Use of local observations means that decision makers have an additional source of data, including an increase in sample size due to a larger number of direct observations.

well as determine their usefulness for policy and decision making. 🌐

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SOUTH AFRICA: AN ENVIRONMENT FOR RECONSTRUCTION

In winter 1994, an oil spill off Cape Town, South Africa threatened breeding colonies of the endangered Jackass penguin. At roughly the same time, hundreds of shacks were flooded by rain in the Cape Flats, an area that qualified for wetland status, but which under apartheid was a place to live, however vulnerable.

The first disaster became international news and volunteers — mainly white — offered to scrub oiled birds. The second disaster went largely unnoticed, except by the Red Cross, which handled relief operations for residents of Cape Flats. The two incidents generated heated debate about whether endangered species count more than people in environmental matters.

This question finds a response in an international environment mission that puts people back on the environmental agenda in South Africa. Funded largely by CIDA and managed by IDRC, the mission enjoyed sponsorship from the African National Congress and other national organizations. Mission members — South Africans as well as representatives from Canada, India, Malaysia, Uganda and Zimbabwe — travelled throughout South Africa in February 1994 to gather information to guide policy initiatives in the enormous task of reconstruction and development.

One of the most important themes to emerge was that without action to redress the environmental toll of apartheid, South Africa's efforts to right the wrongs of the past would run to nothing. "Reconstruction and development in South Africa will only succeed if environmental considerations are built into all sectoral



IDRC Karen Sporkel

South Africa. The environment mission recognizes that those living in the poorest socio-economic conditions feel the effects of environmental damage far more strongly than better-off members of society.

policies and into all economic research programmes including international trade and competitiveness," said mission leader Anne Whyte, speaking at the launch of the mission report last September in Cape Town.

Whyte, who is also director general of the environment and natural resources division of IDRC, noted that the "accounts" of national wealth versus national debt were written in the distance women had to walk to collect firewood, in the diarrhoeal diseases that rural children suffered because of dirty water, in the loss of fishing and misallocation of national water resources and in people's exposure to toxic waste.

These effects of environmental decline are not felt equally by all South Africans, as the mission

observes: "The environmental costs owed by society are almost always paid for by those least able to do so: the poor. In this way, environmental degradation is a visible expression of social inequity."

MEANINGFUL PARTICIPATION

One of the key issues for the mission was the lack of public participation in previous environmental policy. Mission member Chris Albertyn felt that its strongest recommendation was the need for structures to allow meaningful participation in government.

However, environment minister Dawie de Villiers, one of a handful of National Party ministers in the Government of National Unity, expressed "wariness" about creating

too many new structures given that the country had to create nine new provincial environmental structures. But this view is at odds with one of the mission's main thrusts, which is to strengthen the existing department of the environment and to involve civil society in keeping watch on the environment.

The involvement of ordinary people in the mission's research efforts was regarded as "unique" by Forestry and Water Affairs Minister Kader Asmal who praised the mission's efforts to elicit grassroots, community concerns regarding the environment.

Encouraging further public involvement is one objective of a mission recommendation to establish provincial and national Environmental Advisory Forums to act as channels for business, civics, trade unions and NGOs. These forums are intended to replace the existing Council for the Environment, which fails to represent all sectors of South African society.

The mission also calls for a "commissioner for the environment," similar to an ombudsman, placed in the office of the president and reporting annually to parliament. It also calls for a single environmental monitoring and assessment agency to enforce environmental standards and to work with industry and local communities. At present, environmental "policing" in South Africa is spread across a multitude of departments — thus putting one department in charge of the water in a river, another of the soil on its banks, and a third of the air around it.

The country can no longer afford such an uncoordinated response to urgent environmental problems. Indeed,

THE HUMAN TOLL OF APARTHEID'S ENVIRONMENTAL LEGACY

Almost 20 years ago, Grissel Masiza travelled to Cape Town from her birthplace Cofimvaba in the Transkei, a tribal homeland on the Eastern Cape coast, to look for work. Her husband had earlier migrated to the city but had died of a lung complaint while working at a fish factory. At the time, African people were not welcome in the Western Cape. Women particularly had no security of tenure due to laws aimed at keeping Africans away from the city, forcing the majority to survive off 13 percent of rural land allocated to them. One of seven children, three of whom died young, Grissel spent her childhood looking after sheep and goats, and managed to complete seven years of school. Her family were subsistence farmers and her mother earned extra cash by weaving mats and baskets. In the Transkei, people were faced with diminishing water supplies, increasingly eroded land and dwindling pastures. "More and more people were coming but there was no place to stay," Grissel recalls.

Life in the city was not exactly a step up. Grissel found herself sleep-

ing on a cement slab in a single-sex hostel. But at least there was work. "After a time I heard about a place called Crossroads and I went there to make my own place," initially a plastic shelter that she had to abandon in 1986 when Crossroads erupted in political violence.

Her next — and current — home was in Site B, Khayelitsha, a sprawling shackland of over a million people. Grissel built a corrugated iron home on a "site-and-service" scheme that provides water and an outside toilet. She lives there with her son, a grandson, a nephew and a little girl sent to the city for schooling. Today, at 58, Grissel works full-time as a childminder in a leafy suburb that she travels to by train. She is resigned to her fate, hoping only to return home to the Transkei when she retires. For now, she wishes something could be done about the filthy city streets, the lack of trees, and the water that floods her shack in the wet season. Until this interview, Grissel had never heard the word "environment," yet her story epitomizes the environmental concerns of ordinary South Africans.

the mission makes the following observation: "What we have seen for ourselves and have heard from South African experts, has convinced us that the environmental room to manoeuvre has already been largely used up."

The message is clear. South Africa can either turn toward environmentally sustainable economic growth, or choose an environmentally destructive path as the pressure for land, housing and

jobs builds up. In the mission's view, there is only one way to go. Let's hope, for the sake of all who live in it, the new South Africa is listening. 🌐

ANDREA WEISS *in South Africa*

The full report of the environment mission will be published jointly in October by IDRC Books and Ravan Press (South Africa) as Volume Four in the series *Building a New South Africa*. ISBN 0-88936-759-0

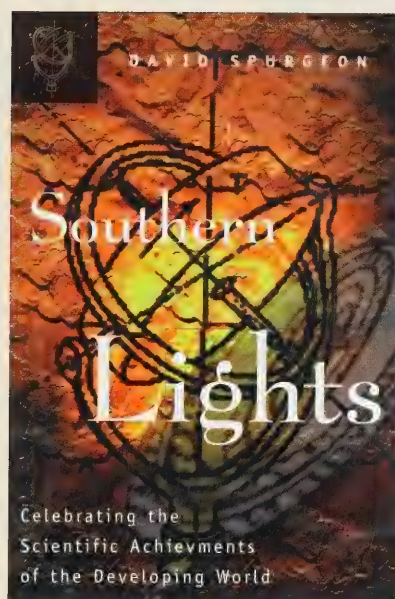
Southern Lights

Celebrating the Scientific Achievements
of the Developing World

By David Spurgeon

Manuel Patarroyo, a biochemist from Colombia, South America, has developed the world's first safe and effective malaria vaccine. Ironically, it took him only 4 years to make his discovery, but 6 years to convince the world that the vaccine worked.

Is this a case of intellectual racism? Are discoveries by Third World scientists properly recognized?



Southern Lights pays tribute to the many scientific and technological achievements of scientists from the developing world — achievements that have not been sufficiently recognized in the North. Using concrete examples, author David Spurgeon illustrates the important role that science from the developing world and effective collaboration between North and South can play in solving the major global problems of today.

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REPORTS

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FOCUS

This issue of *IDRC Reports Magazine* is dedicated to the thousands of researchers with whom IDRC has been associated over the past 25 years.

In this, IDRC's 25th anniversary year, it is appropriate to pay tribute to the women and men in Africa, Asia and Latin America whose research, teaching, writing and influence on others have made a mark on their community and sometimes on the world at large. While only a small fraction are profiled in this issue, their stories offer insights into the types of contributions which the larger population of Southern researchers is making in development. The profiles also shed light on the personal challenges and struggles researchers in the South face as a matter of course.

There are fascinating personal anecdotes as well as concrete lessons learned in areas of research. The profiles detail various aspects of researchers' education, professional development, training, and scientific research in the lab and out in the field. A variety of disciplines and Southern regions are represented. Altogether, the articles exemplify and provide strong affirmation of the IDRC philosophy of "empowerment through knowledge".

E. Conway

Editor-in-Chief



IN SPRING 1995 look for the IDRC book *In Person: Profiles of researchers in Africa, Asia and the Americas* (ISBN 0-88936-738-8), a collection of some twenty articles highlighting the work, personalities and interesting life stories of southern researchers working in health, the environment, agriculture, information science, social and economic policy, and technology.

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Defender of pluralism and democracy, avid traveller, voracious reader, **José Antonio Ocampo Gaviria**, is now minister of agriculture in Colombia and through his research and some 15 published books, has helped shape economic and social policy.

Support to Southern Scientists: Achievements and Lessons Learned

In large part, the accomplishments of IDRC over the past quarter century may be said to rest squarely on the shoulders of hundreds of innovative and tireless researchers throughout the developing world. Therefore, IDRC's 25th anniversary offers an excellent occasion to celebrate the achievements of the many researchers the Centre has helped support, and to draw lessons from its experience in supporting research for development.

For 25 years, strengthening indigenous research capacity in response to needs determined by the people in developing regions has been an enduring element of IDRC's strategy. Some idea of the success of this approach is provided in a 1993 analysis of IDRC's experience in strengthening research capacity¹. According to the author of the analysis, Tim Dottridge, strengthening the capacity of individual researchers in the South is implicit rather than explicit in the IDRC approach. Centre programs support institutions working on research that addresses development problems, with capacity-building usually as a secondary objective. Although both formal and informal training provisions are often built in, they usually have been geared directly to the technical needs of a specific project. In addressing development problems this way, IDRC pioneered support to empower Southern scientists to define development problems and to conduct relevant research.

Based on the conviction that one of the best ways to build capacity is through actual research activity, the primary target of IDRC support has been research designed and undertaken by developing country researchers working in institutions in the South, often in linkage with others working on related problems elsewhere in the world. While most projects funded are in established institutions with an experienced research team and focused on problem-solving research rather than on capacity-building, a smaller number of the Centre's projects are essentially capacity-building exercises to augment hands-on research experience.

Over 20,000 developing country scientists are estimated to have worked on projects supported by IDRC. About two-thirds were senior researchers, usually graduates; the remaining third were more junior. IDRC evaluations suggest that on-the-job research training in the developing country context is effective in strengthening indigenous capacity not only to focus research on topics related to national



Maria Therezinha Martins, microbiologist, Brazil. IDRC has seen the stature of many of its grant recipients increase dramatically, along with their capacity to contribute to development.

priorities, but also to utilize and contribute to local and international publications and meetings; to test results in field conditions, utilizing local industrial and agricultural extension agencies; to attract funds from other sources; and to develop practical skills in research management.

Both formal and informal training have been used to complement the practical experience gained through IDRC-funded projects. In the 1983-89 period, training absorbed approximately 13% of total program funding, and a third of projects had a training component. Roughly two-thirds of this funding went toward informal training such as short courses, seminars, workshops, and group and network-

based training, with formal, degree-related training accounting for the remaining third. Of the degree-related training, 52% was for Master's degrees and 32% was for PhDs.

Capacity-building is also a function of collaborative projects linking Southern scientists with Canadian scientists in similar fields to work on related research problems. Developing-country researchers, through cooperation with Canadian researchers have access to new people, techniques and information. And Canadian researchers have an opportunity to look at their work in different, broader contexts and to adapt their approaches to conditions in other countries. The Centre is currently evaluating collaborative activities to determine the strengths and weaknesses of this mechanism.

The arrival of the "information revolution" validates and gives urgency to the long-held goal of IDRC's Information Sciences and Systems Programs to make Southern information professionals and practitioners recognized as key players in empowering developing country societies to apply knowledge for their own benefit. Efforts in this field have included short-term courses to meet immediate requirements for up-grading practical skills in specific fields, as well as improving opportunities for postgraduate education to strengthen professional capacity for addressing long-term needs in identifying, processing, retrieving, repackaging and disseminating information for development. Examples include a regional consortium of information science graduate schools in Africa, and strengthening training capacity in information handling in Asian and South Pacific countries.

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IDRC AND THE WORLD SUMMIT FOR SOCIAL DEVELOPMENT (WSSD)

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"It is unacceptable that individuals and societies with the fewest resources — the poor, the unemployed, the weak and the vulnerable — should have to bear the greatest burden of the economic and social transformation of our world."

— UN Secretary General Boutros Boutros-Ghali

WHY A SOCIAL SUMMIT ?

On 11-12 March 1995, heads of State and Government from around the world will convene in Copenhagen, Denmark to grapple with three core social problems: poverty, unemployment, and social disintegration. The World Summit for Social Development, popularly known as the Social Summit, will mark the first time in the history of the United Nations that heads of State and Government will meet to address social development as a central issue on the international agenda.

Poverty

In the last half of the twentieth century, the world has witnessed unprecedented material progress and rapid transformation of society resulting from economic, political, and cultural globalization; however, amidst the remarkable material gain, human misery has also soared — poverty has become a term too familiar not only to the developing world but also within various pockets of the industrial nations. The structural imbalances that permeate modern day society have resulted in unequal distribution of the benefits of progress and have accentuated the gap between rich and poor citizens — a phenomenon which the UN Secretary-General describes as "Social Darwinism" in which only the "fittest" survive.

Unemployment

Increased world-wide unemployment and underemployment rates have also contributed to the persistence of poverty and have exerted additional social pressures on governments. In the last decade, the world has witnessed rampant unemployment both in the industrial and developing countries.

According to a United Nations report, "of the world labour force of 2.8 billion people, an estimated 30 per cent — most of them in developing countries — are not productively employed and of these, more than 120 million are fruitlessly seeking jobs that simply do not exist". The same report reveals a staggering number — 700 million people — are underemployed, working long hours but not earning enough to lift themselves and their families out of poverty.

Social Disintegration

Amidst this scenario, the world is also faced with multiple challenges of social disintegration: conflict, migration, crime, domestic violence, corruption, substance abuse, and drug trafficking.

It is against this background that the 1995 World Summit for Social Development has been initiated. The ultimate goal of the Summit is to solicit world-wide commitment to put human beings at the forefront of development strategies. Three inter-related themes form the core issues at the Summit:

- alleviation and reduction of poverty
- expansion of productive employment
- enhancement of social integration

The Summit intends to mobilize agreement amongst the heads of State and Government from around the world toward joint and systematic action on these three core social issues.



THE PREPARATORY PROCESS

A small secretariat, headed by Jacques Baudot, has been created in the UN Department of Policy Coordination and Sustainable Development under the direction of Under-Secretary-General Natin Desai, to coordinate preparations for the Summit and to provide support to the Preparatory Committee (PrepCom). The PrepCom, headed by UN Ambassador Juan Somavia, has so far held two sessions comprised of all member States and UN agencies as well as NGOs who have taken very prominent roles in the various national and regional preparations for the Summit.

Canada has created an interdepartmental steering committee (WSSD-CIC), under the leadership of the Department of Foreign Affairs, to be responsible for the official Canadian position. The new Department of Human Resources Development coordinates the national focus while CIDA, through a CIDA Coordination Committee (CCC), is responsible for coordinating the international focus. Branches in CIDA concerned with preparations for the Summit and a number of Canadian institutions, including IDRC and the North-South Institute, are represented in the CCC and they have all contributed ideas and direction to the Canadian position paper.

IDRC-SUPPORTED INITIATIVES AND THE SOCIAL SUMMIT

IDRC, through its Social Sciences Division, is supporting activities in several regions which have a direct bearing on the central themes of the Summit, i.e. alleviation of poverty, enhancing productive employment and social integration. The activities include the following:

Support for the Consultation Process: Latin America

The issues included in the agenda of the World Summit for Social Development are directly relevant to the current conditions of the countries in Latin America. Efforts have been made in the region to ensure that governments participating in the Summit not only reflect their official position regarding the future of social development, but that in doing so they represent the views and concerns of the various actors in their respective societies.

As a contribution to these efforts, IDRC has supported extensive consultation processes in Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, and Peru which are aimed at establishing a dialogue at the national level on the core themes of the Summit. The overall objective of this initiative has been to provide support to research and research-related activities carried out by developing country researchers which contribute to the achievement of one or more of the following:

- (i) strengthen the policy position of national governments in preparation for the Summit;
- (ii) encourage national/regional dialogue on the core Summit themes; and
- (iii) raise the profile of the Summit and of social development and social policy issues at the national and regional levels.

In each country, local research centres worked jointly with other research and policy institutions, NGOs, development practitioners and policy-makers to discuss the Draft Declaration and Programme of Action drafted by the UN Secretariat for the Social Summit. A report reflecting comments and recommendations was produced and widely disseminated among government officials for consideration in preparation of their Summit position papers.

In addition, on 26-28 October 1994, IDRC hosted a workshop on "Social Policy in a Global Society" attended by members of the Latin America Social Policy Network and other participants representing a mix of policy-makers, researchers, bilateral donors, and NGOs. The workshop provided a forum for discussing the challenges of developing effective social policies amidst rapid global social, economic, and cultural changes and constrained resources. One of the objectives of the workshop was to contribute to on-going debates on social reform in Canada and Latin America, particularly in relation to the social policy implications of regional economic integration and the World Summit for Social Development. The workshop will result in the publication of a book.

Social Policy Network: Western and Central Africa

In Western and Central Africa, members of the newly-formed Social Policy Network — Burkina Faso, Cameroon, Ivory Coast, Gambia, Ghana, Guinea, Mali, and Senegal — discussed the preliminary version of the Programme of Action prepared by the WSSD Secretariat and put together a summary of their reactions. This document was sent to Summit representatives of various countries to assist them in preparation for their Summit position papers.

The document approached the three themes of the Copenhagen conference in light of five priority issue areas for Africa:

- higher education and research
- industrialization and economic integration
- an emphasis on the informal nature of the economy
- the role of cultural values
- poverty.

The Western and Central Africa Social Policy Network was established in January 1994 as a result of a seminar organized by IDRC in Saly Portudal, Senegal which brought together researchers, policy makers, development workers, and sponsors to discuss their experiences and to define the problems and approaches associated with formulating and implementing social policies in the specific socio-economic context of the region of Western and Central Africa. The network, which will attain official status in early 1995, is expected to incorporate into its priorities the recommendations of the Social Summit.

Social Policy Research and Practice: Eastern and Southern Africa

An IDRC-supported project in five African countries (Uganda, Tanzania, Zambia, Zimbabwe and Botswana) examines the current scope and practice of social policy, the role of government and non-government actors in social policy-making, and sources and uses of research on social policy. The aim of the project is to develop an integrated conceptualization of social policy and identify approaches which are relevant to African conditions. The project will culminate in national workshops bringing together researchers from various disciplines with policy-makers from relevant sectors to identify priorities for further research.

Urban Poverty and Survival Strategies: Kenya

A project, undertaken by the University of Nairobi in collaboration with Canada's York University, aims to analyze how the Kenyan government, non-government organizations, and traditional social support systems address poverty.

Social Sector Decentralization: Asia

A collaborative project in Asia is supporting a network of researchers from Indonesia, Philippines, Thailand, and Vietnam to conduct reviews of decentralization policies and programs in the region in order to develop country-specific guidelines to facilitate effective decentralized strategies.

Social Reconstruction: Global

In collaboration with other donor agencies, IDRC is supporting a global initiative entitled "Rebuilding War-torn Societies" which is coordinated by the United Nations Research Institute for Social Development. The project is intended to help the international donor community and local authorities to understand and respond to the complex challenges of rebuilding societies emerging from violent internal conflicts. Through a participatory analysis of current cases and experience by international and local actors, the project examines policy options and strategies in pursuit of the twin objectives of peace and development. It is anticipated that the project will contribute to a better integration of different forms of international assistance within a coherent policy approach and will enhance the impact of external assistance in supporting local efforts at social reconstruction.

Social Reconstruction: Africa

A joint project by IDRC's regional offices in Africa aims at contributing to the development of an African framework and methodologies for social reconstruction in countries emerging from conflicts and socio-economic and environmental disintegration. The objective is to identify, through analysis of relevant experiences in the region, means to overcome social fragmentation, build consensus and legitimacy of state institutions, broaden opportunities for people in society, and reconstruct social institutions (education, health, and human settlements).

Labour Flexibility and North-South Employment Problems

IDRC is currently supporting a 7 country North-South study looking at the links between macro labour markets, labour institutions, and labour training and skill requirements. The emphasis is on the need for coordination of policies at all levels rather than simple reliance on macro flexibility. In the upcoming fiscal year a project is planned on analyzing more directly the links between labour markets in the North and the South, taking into consideration the issue of labour standards.

In addition to the above projects, IDRC provides on-going support to research and capacity building initiatives for social and economic policy analysis, planning, and evaluation on key areas such as employment, poverty, education, urbanization, changing state-civil society relations, and globalization.

ANTICIPATED OUTCOMES OF THE SOCIAL SUMMIT

The future of society will be very much shaped by the actions and decisions taken today. If the current worldwide social trend characterized by severe poverty, unemployment, and rapid marginalization of disadvantaged groups — particularly women and the elderly — continues unabated, the social fibre of society will disintegrate, making it impossible to attain sustainable development. To reverse the current trend governments worldwide need to collaborate on joint action. This requires political will and commitment to put sustainable human development at the heart of national and international development agenda. The following are some of the anticipated outcomes of the social Summit:

- Reaffirming commitment to the social development goals that have been agreed to by governments in recent years;
- Consolidating the agreements reached at previous U.N. conferences and highlighting common themes such as gender equity and empowerment;
- Underscoring the need to integrate social development concerns into policy-making at the government and institutional level and strengthening coordination among the relevant national and international agencies;
- Establishing poverty reduction targets;
- Setting targets for national public spending on social development priorities;
- Establishing "compacts" on investments for social development between donor agencies and governments; and
- Agreeing on procedures to reform the international development institutions.

A follow-up report and analysis of the Social Summit will appear in the July issue of *IDRC Reports*.

*This document was prepared by the Social Policy Program of IDRC.
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THE RECOGNITION FACTOR

Another, much more subtle way in which IDRC has bolstered the ability of individuals to contribute to development has been to raise the profile of researchers individually and in groups, thereby increasing their recognition and influence. One way this is done is through links with other researchers in their fields. Domestic recognition is often the result of recognition at international workshops, symposia, networks and other linking mechanisms that are basic to IDRC's approach. It can also stem from press coverage of such events or from a significant research breakthrough. By recognizing the quality and potential of a particular line of investigation and by providing researchers with the resources to make a significant contribution, nationally or internationally, IDRC has seen the stature of many grant recipients increase dramatically, along with their capacity to contribute to development.

During the early 1980s, in response to hostile environments for social science research within countries under military rule in the southern cone of Latin America, IDRC offered special institutional support to social science research institutions in these countries to cover both research and overhead costs. Other donors cooperated in this effort and, as a result, nine social science research institutions in Argentina, Chile and Uruguay had sufficient financial security to maintain a productive core of research staff during a difficult and uncertain period. Then, during the post-military period in these countries, the institutions and social scientists began to receive financial support from their own governments. Now many of these researchers have made significant contributions to economic and social policy in their own countries. Some now hold positions of power and leadership in civilian, democratic governments.

While it is difficult to assess the total impact of IDRC support on Southern scientists, information drawn from EVIS, the Centre's evaluation database, provides some lessons concerning the effects on Southern researchers involved with IDRC-supported projects. Beyond the strengthening of technical skills and experience, researchers report being "motivated" by having had the opportunity to use their skills and having been able to gain credibility and confidence. Also of great importance has been IDRC's support in helping researchers in the South overcome isolation through information systems, conferences, collaborative projects and other mechanisms that provide links with other researchers around the world.

OVERCOMING ISOLATION

A 1991 global tracer survey of IDRC award recipients noted that over 80% were very satisfied with the theoretical and substantive knowledge gained; and that the training was very helpful in advancing their overall careers. The major problem facing trainees when they return home is a chronic lack of research funds and an abrupt end to ongoing contact with other trainees and the research community at large. Training without subsequent support is a problem increasingly noted in evaluations. The provision of continu-

ing support and the development of networks linking past trainees working on topics of mutual interest has been suggested as one method of surmounting this isolation.

A portion of IDRC program funds has also gone toward small grants to improve individual researcher skills. These grants have had a great impact by fostering networking within countries, allowing exchanges of information, breaking academic isolation and promoting the emergence of a scholarly community. To strengthen the competence of individual researchers, monitoring and technical supervision of grantees and the critical review of research reports are essential.

In an effort to evaluate yet another component of IDRC's support and capacity-building role in the work and achievements of Southern scientists, the Centre is presently conducting a strategic evaluation tracer study of former IDRC-supported project leaders. While there have been tracer studies of former IDRC training and fellowship awardees, there has been no aggregate assessment of where IDRC-supported project leaders come from, where they go after IDRC support, and how their relationship with IDRC affected their professional development. This tracer study will attempt to fill this gap (and will be featured in a future issue of *IDRC Reports*).

Initial findings from the project leader tracer study, and other Centre evaluations, have revealed that many IDRC-supported researchers have gone on to make significant contributions to sustainable development. This issue of *IDRC Reports* is dedicated to profiling individual researchers and to celebrating their accomplishments. Along with many others like them around the world, these researchers give us cause for celebration this anniversary year. It is their commitment and dedication to their work, often under severe and challenging circumstances, that provides inspiration in the quest to answer the pressing problems of our times.

Terry Smutylo is Director, Evaluation Unit and Philip Ward is Researcher, Evaluation Unit, Corporate Affairs and Initiatives Division, IDRC, Ottawa.

¹ Tim Dottridge, "Strengthening research capacity: the experience of the International Development Research Centre," in *Development and strengthening of research capacity in developing countries*. RAWOO: Advisory Council for Scientific Research in Development Problems, The Hague, Netherlands, 1993.



Pictured above, centre, Vo-Tong Xuan says his most enjoyable times are spent out in the countryside helping farmers with their rice crops.

Vo-Tong Xuan

Dr. Vo-Tong Xuan is living proof that a single individual can have an enormous impact on a country's progress.

Born in 1940 to a poor family in An Giang in southern Vietnam, Xuan is now vice-rector at the University of Cantho and a member of the Vietnamese National Assembly. His proudest achievement is his leadership in helping transform war-ravaged Vietnam from a rice importer into the third largest rice exporter in the world, all within one decade.

Xuan is one of the foremost Vietnamese agricultural scientists, and was honoured in 1993 with the Ramon Magsaysay Award for government service. The award, begun in 1953, honours the late Philippine president and today it is considered by many as Asia's equivalent of the Nobel Prize.

In its citation to Xuan, the award committee praised his efforts toward rebuilding a war-devastated Vietnam: "Xuan elected to forsake safer and more lucrative positions elsewhere and returned home to Vietnam to extend his activi-

ties beyond the university and into the fields." The committee further lauded his work in "combining practical scientific research and effective advocacy to improve the lives of Vietnamese farmers."

Certainly, Xuan does not keep his admiration of the Vietnamese farmer a secret. "My personal goal in life is to serve my country and to work on behalf of the Vietnamese farmer", he says.

To appreciate the magnitude of Xuan's achievement in greatly increasing rice production in Vietnam, consider the hurdles involved. For the plan to succeed, it required convincing the Marxist government to put aside the collectivized system of agriculture in favour of land tenure to individual farmers; it involved developing in the laboratories better technologies such as high-yield rice varieties; it required training and inspiring a large cadre of agricultural extension workers; and perhaps most challenging of all, it involved educating and motivating millions of peasant farmers in Vietnam to modify their traditional way of farming and accept new technologies and techniques generated by agricultural research.

Even when his ideas were unpopular with the government, he held his ground until the government began to see things his way. After conducting secret and highly

illegal experiments on the relationship between crop yields and land tenure in the late 1970s, Xuan used his weekly educational television program on farming methods to broadcast a devastating indictment of the state farming system in September 1980. The experiments involved testing a new contract system whereby farmers undertake to produce an agreed-upon amount for the state; everything over and about that amount is for the farmers to keep and sell for their own profit.

After the September 1980 television shows, the immediate reaction from government officials was anger and defensiveness — and Xuan was nearly prosecuted. Luckily, he had allies among provincial officials and within four months, the government began abandoning state farms in favour of individual farmers' leases which provided better incentives for farmers to produce more rice.

Yet why did this man — son of a poor clerk and raised in the city — chose a life in agricultural research and advocacy on behalf of the Vietnamese farmer? He himself is not even remotely from a farming background.

"I do not come from a farm, it's true," he admits. "My family was poor, my father was a clerk and we moved several times when I was a child but always we lived in towns or cities. During high school exams, however, I used to escape the noise of the city and go for study breaks to my uncle's farm in the country. I remember being utterly amazed at how hard he worked, the long, long hours of work and toil, and yet how little financial gain he received. He and all his neighbors were the same: they all lived in extreme poverty."

When he finished high school, he wanted to pursue university studies in engineering; however, the university was offering scholarships only in agriculture and since he needed a scholarship, he applied and was accepted.

Hard work is a habit he learned early in life. "My father earned almost nothing in his job and so as a family we all had to work hard to survive. As a boy, I usually had one or two part-time jobs selling newspapers, guarding cars, whatever I could get, and of course also keeping up with my schoolwork. I feel lucky I did not come from a rich family, as I can appreciate the importance of work and I sympathize with other people who labour."

He studied agricultural chemistry at the University of the Philippines during 1969-71, specializing in sugar cane but he switched to rice when he realized that rice would be more important to the future of agriculture in Vietnam.

Twice in his life he has made a decision to stay and work in Vietnam.

The first time was in 1971 when he was working in the Philippines and was offered a job to come back to Vietnam to the University of Cantho. Returning was not an easy decision because he had a good job in Manila and was able to avoid the war; however, he felt a strong commitment to return because he was convinced his knowledge could help

Xuan elected to forsake safer and more lucrative positions elsewhere and returned home to Vietnam to extend his activities beyond the university and into the fields.

Vietnam rebuild its agriculture sector. His wife agreed, and they moved with their children back to Vietnam on 9 June 1971.

The second time was in 1975 in Japan where he was completing work on a PhD and, with the Vietnam war about to end, he wondered if it wouldn't be better not to return to Vietnam.

"Yet during my time in Japan I had met many successful farmers who had good science and technology to help them, and so I was inspired to try to achieve the same for the Vietnamese farmer." He returned on 2 April 1975 at a time when most of the traffic was going the opposite way, out of Vietnam.

Xuan credits his success to the support of his wife of 32 years, Ngoc Le, who has been a strong ally especially during difficult times. They have two children and enjoy a close family life.

Xuan is currently involved with an IDRC-funded project, Vietnam Farming Systems Network, begun in 1991 and aimed at training people in farming systems research and extension methods. It also will develop appropriate agricultural systems that are economically and environmentally suitable. Nearly 100 farming systems specialists have been trained so far and they, in turn, are training other agriculture extension workers, ministry employees and farmers. The project has developed various environmentally sound, economically sustainable farming systems such as: sloping land agroforestry systems in the hilly and mountainous regions, and rice fish or rice shrimp systems in the fresh water and saline water regions.

As to the future of Vietnam, Xuan foresees the need for changes in technology and policy. "On the technology side, we need to develop even better rice varieties that can produce yields of at least 30% more, and at the same time these varieties must offer good eating qualities. We must develop more efficient ways of pest control and fertilization control so we can be sure of a clean environment. On the policy side, the politicians must design a better policy which offers greater incentives to the farmer. Since I am a member of the national assembly, I always try to push to create a political climate which is conducive to better agriculture. We need to address the serious growing gap between rich and poor farmers.

"Vietnam is on the path to prosperity, although the advance is still slow. We have overcome all kinds of political, economic and social difficulties. I am proud to have been part of that."

Eileen Conway is editor-in-chief of IDRC Reports Magazine.

Hari Gunasingham

Born in Sri Lanka and now living in Singapore, chemist Hari Gunasingham is among Asia's leading innovators. The son of a diplomat, Dr. Gunasingham lived in Washington, Bangkok and Sri Lanka while growing up. He took a degree in chemistry and a Ph.D in analytical science at England's Imperial College.

From England, Gunasingham moved to Singapore, where he taught at the National University for ten years. In 1985, he began to develop process control technology for agriculture industries in developing countries. One of his first projects later led to the development of SYNAPSE, a PC-based commercial process control system.

In 1990, he and colleagues Bhaskar Narayanan and Wong Mun Leong left the university and started Eutech Cybernetics, a research and manufacturing facility, which now employs about 100 people. A subsidiary in Sri Lanka with 12 staff was set up to execute a project to optimize the manufacturing of tea. One of the first set of industrial applications funded by IDRC was the adaptation of the SYNAPSE software to optimize the manufacture of tea in Sri Lanka.

The tea produced on Sri Lanka's 600 tea plantations is vital to the country's economy, but obsolete equipment and traditional processes lead to waste, cost overruns and environmental damage. The tea leaves are dried in wood-burning ovens, which mostly burn inefficiently. Fuelling the ovens is leading to significant deforestation and air pollution.

"SYNAPSE optimizes the process by monitoring temperatures," explains Gunasingham. "By ensuring that the fires burn more efficiently, we can conserve trees and cut down on air pollution." When fully developed, SYNAPSE will be a full management information system including inventory control, payroll, record keeping, purchasing, and distribution.

A prototype of SYNAPSE is now installed in one tea factory in Sri Lanka. It and other factories in Sri Lanka will serve as demonstration sites for the transfer of the technology to neighbouring tea-growing countries and to other industries such as food processing, palm oil production and petrochemicals.



Innovator and researcher Dr. Hari Gunasingham has developed computer software for industrial purposes such as tea manufacturing and the management of harbour activities.

IDRC/Catherine Wheeler

Gunasingham intends to incorporate the technology into new tea manufacturing equipment. "It's early days yet, but we should see some real results in 1996 or 1997. Between the 600 tea plantations in Sri Lanka and 4,000 in India, there will be a very significant environmental impact if the software is widely used to ensure the ovens burn more efficiently."

Other applications of SYNAPSE are in the areas of pollution control, resource recycling and recovery, and energy conservation in selected highly polluting industries in the Asia Pacific and in Canada.

"Hari Gunasingham is a brilliant, shy entrepreneur," states Randy Spence, the Director of IDRC's Asia office. "He has brought together development and technology in a unique way. Hari's is the first project of this kind that IDRC has been involved in — it has taught us a lot, and to some extent defined a new direction for IDRC in these rapidly

changing times."

Innovations like SYNAPSE are highly suited to contributing to sustainable development, a favourite subject for Gunasingham. "To be an agent of change, your model must be one of sustainable development," he says. "I would say that the corporate vehicle is a very good vehicle for sustainable development because it is efficient, not wasteful."

A family man, Gunasingham balances the demands of a new business with the needs of his wife and two daughters, aged five and ten. Despite a six-day work week, Gunasingham claims that he never needs a holiday. "A holiday as a logical break from work is alien to me. What would I do on a holiday — rest, enjoy myself? I do those things in my normal day."

Gunasingham continues to play his role as visionary-in-residence, contributing his own ideas and creating an atmosphere in which others can innovate. His aspirations? "I want to overcome my limitations, improve my knowledge, try to be creative, and do things that are of some use and can be applied to make life easier and better for people."

Catherine Wheeler is a journalist in Singapore.

Gelia Castillo

A specialist in rural sociology, Filipino social scientist Gelia Castillo was an early pioneer in the concept of participatory development. Her ideas have influenced thinkers, policy makers and decision makers in government, international development circles and academe.

"What's very very significant in my life is the fact that we were poor," says Gelia Castillo, recalling her early childhood. At 66, she is retired from academic life and has left an impressive body of work, but it is her early years which left the most indelible imprint on her. "I come from a poor family but life has been good to me, and I shall return it somehow. That is my philosophy. I join projects and causes which have a direct bearing on people's lives."

Her parents were a strong early influence, especially her father, Antonio Tagumpay, who convinced her that academic achievement would be key to her future. He was a government clerk, while her mother was a cook who sold prepared meals door-to-door and sometimes worked in the kitchens of wealthy families.

Castillo began her academic training with a Bachelor of Arts in psychology from the University of the Philippines. Later she went on to earn a Master's degree in rural sociology from Pennsylvania State University and her Doctorate from Cornell University. For many years Castillo served as a professor of rural sociology at the College of Agriculture, University of the Philippines.

Throughout her career, Castillo published extensively on subjects encompassing women's roles, the sex roles of Filipino adolescents, agricultural school administration, the team approach in community development, rice and potato farming, the changing social images in a developing society, and the protein gap.

Beyond Manila was her most famous book. It was the first comprehensive research work on income distribution, employment, labour, education and migration in the rural Philippines. She underscored the definition of a "household," observing that the role of women and children contributes greatly to the dynamics of society.

"One person can only do so much, especially if it is performed in an outstanding manner," says Priscilla Juliano, an associate professor at the College of Agriculture in Los Baños. "She's a nagger of sorts. She pushes people to do



Gelia Castillo is a highly respected specialist in rural sociology: "I was born into a poor family in the Philippines but life has been good to me."

IDRC/Criselda Yabes

competent work. She has academic and intellectual independence, and a consistent ability to do exceptional academic pieces. Probably, this is helped by the fact that she is supported by her husband."

Gelia met her future husband, Leopoldo Castillo, at the university in Los Baños shortly after graduating from the university. One year later they were married. "Pol," as Castillo calls her husband, is an animal nutritionist and now professor emeritus of the Institute of Animal Science. The couple has two daughters and one son.

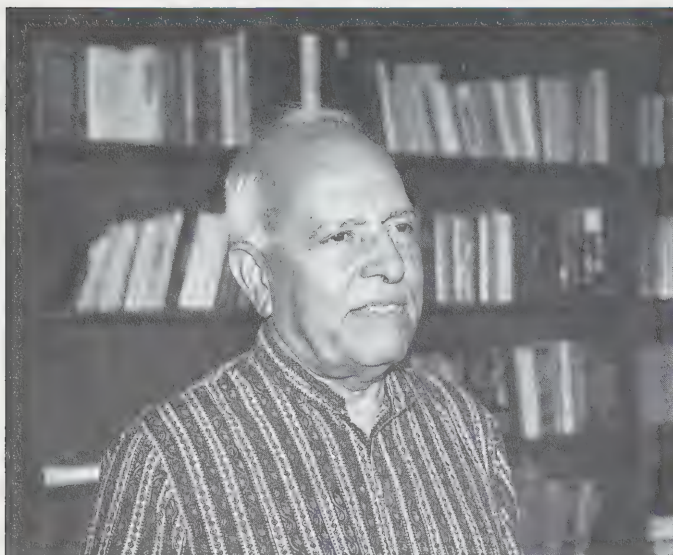
"My husband has always been very supportive and has never had any insecurities about my career. I never felt as a woman that I was at a disadvantage." For six years, Gelia Castillo was the only female member of the board of the Peru-based Inter-

national Potato Center. She has also served on the boards of IDRC, the International Service for National Agriculture Research, and the International Council for Research in Agroforestry.

Yet Castillo does not regard her experience as universal. "Affirmative action is necessary because in many countries women are really at a disadvantage. Sometimes I think the feminist movement has only been good to the female professionals, but has it helped the poor women or are we just using the poor women to advance our own case? I know this is unpopular thinking and I notice that each time I say these things I'm no longer invited to speak to that group again."

Recently retired, Gelia has no intentions of spending her remaining years in a rocking chair. "I never really worry about my age. I don't feel old, intellectually and emotionally. It's important for me to stay intellectually alive."

Criselda Yabes is a journalist and author in Manila.



Gursaran Talwar

Almost twenty years is a great sacrifice in time to devote to a single research project, but this is how long it has taken Dr. Gursaran Talwar to arrive at a remarkable achievement: a safe, long-lasting and reversible vaccine to prevent pregnancy in women.

Since 1975, Talwar has had to battle scientific challenges, but also the disbelief of many foreign colleagues. "People felt it was a fantasy," he said of the reaction in the early 1970s to his idea of a birth-control vaccine. "Vaccines are traditionally made for diseases, pestilence, viruses and bacteria — not birth control."

Behind Talwar's professional interest in female fertility and reproductive health lies a personal dimension to his decades-long research. Like many thousands of Indians, Talwar was born at home and it is a sad irony that his own mother died of unknown causes only eight days following his birth.

Now 68, Talwar, Director of India's National Institute of Immunology, began his research to develop a birth-control vaccine in the mid 1970s, relying on financial support from the Indian government and IDRC. His objectives called for a method radically different from previous attempts at birth control. The mechanism of a vaccine matched those objectives because it does not stop ovulation or alter the menstrual cycle, and it does not require the motivation of taking a daily medication. Nor does it involve a doctor having to insert a IUD, which can cause irregular bleeding. Finally, it is reversible and allows women to retain their privacy.

The safety of the vaccine developed by Talwar was tested in exhaustive toxicology studies on animals over ten years. The vaccine works by increasing production in the body of antibodies to the human chorionic gonadotropin (hCG), a hormone normally produced in the uterus to help prepare it to accept implantation of an embryo. By increasing anti-

Gursaran Talwar's lifelong quest for a safe, reliable contraceptive vaccine is now close to completion.

Along the way he has battled disbelief from foreign colleagues: "people felt it was a fantasy".

body production, this hormonal action is blocked and implantation of the embryo does not occur. Therefore, rather than trigger an abortion, the vaccine operates by helping prevent pregnancy. In doing so, it simply heightens a natural process. In women who do not receive the vaccine, about half to three-quarters of embryos fail to become implanted in the uterus because of the action of antibodies normally produced by the body against hCG. The vaccine increases the antibody level to a point where all embryos fail to become implanted.

Women who take the vaccine must have it administered once a month for three months, during which time they must use other forms of contraception. (Talwar is trying to develop a contraceptive for use during this period based on a natural product — the purified extract of the neem tree.) After the third shot, the protection lasts for a year. To continue the contraceptive protection, all that is needed is a yearly booster.

Clinical studies show that among 88 women injected with the vaccine, only one pregnancy occurred over 821 menstrual cycles. Without the vaccine, 250 to 300 pregnancies would have been expected in such a group. Vaccinated women who later wish to become pregnant simply have to discontinue the injections, at which point the hCG is no longer neutralized and an embryo will have a normal chance of implanting in the uterus.

According to Don de Savigny, of IDRC's health sciences division, the vaccine gives women a way to space births. "Ninety-nine percent of global maternal deaths occur in developing countries. This vaccine can help alleviate the problem of insufficient spacing as one of the reasons."

For a man well into his sixties, Talwar has tremendous drive and energy, perhaps owing to his regular practice of yoga and a habit of climbing stairs rather than taking elevators. He is hoping to see the end of all trials for the vaccine by the end of 1995. In the meantime, Talwar has many other research projects on the go, including a male contraceptive, a treatment for prostate cancer and a vaccine against leprosy.

Usha Rai is an editor with the Indian Express newspaper in New Delhi.

Sidi Modupe Osho

Food technologist Dr. Sidi Modupe Osho attributes much of her recent success in research to a somewhat unlikely source — a small cream-coloured bean known as soybean. Simply stated, soybean is nothing less than a “miracle crop,” she says. Soybean was like “a vehicle for me to carry out research activities.”

However, most colleagues would likely say that it is Osho’s own singular intelligence, enthusiasm and dedication that have been vital factors in her achievements in developing food products from soybean that now find growing acceptance among her fellow Nigerians.

Born thirty-five years ago into a large Nigerian family, her love for information was evident from an early age. “As a child, my parents said I was the most curious of my siblings,” she says. Although science became her eventual vocation, throughout her secondary education she was more inclined to the arts. However, as she grew older she became fascinated by science.

At Delta College University Centre, in Michigan, she obtained an associate degree in agriculture, followed by a degree in food science from Michigan State University. Then came a Master’s degree in food processing and technology from Ohio State University in 1982.

Osho’s first contact with soybean in Nigeria came indirectly, through research she was conducting on cassava, a staple in West Africa but a crop with very low protein content — in some cases none at all. She began investigating the potential of legumes that could improve the nutritional value of cassava-based products.

Years after that initial contact, Osho has succeeded in popularizing soybean as an alternative source of protein, one which is affordable and acceptable to Nigerians, particularly among low income and rural communities. Most of her work entails coordinating the soybean utilization and processing program at the International Institute of Tropical Agriculture (IITA), located in Ibadan, southwest Nigeria. For the past seven years, she has worked in a soybean utilization project initiated by the IITA in collaboration with the Institute of Agricultural Research and Training (IART), also in Ibadan, the National Cereals Research Institute, Badeggi, National Agricultural Extension Research and Liaison Services, Zaria, and the University of Nigeria, Nsukka. The project is funded by IDRC.

Osho came well suited to the project, owing to her doctoral research on plantain processing and preservation while at the University of Ibadan. This research allowed her



IDRC/Susan Eshett

Soybean research in Nigeria by food technologist Sidi Modupe Osho could help other countries seeking an affordable alternative source of protein.

to live in a rural community in Oyo State and to learn from villagers the technique of processing *dodo ikire*, a nutritional plantain-based food product that had been developed locally.

Osho worked with an economist, agronomists, agricultural economists and a home economist. The team was multidisciplinary because, as she notes, it had to “develop uses for soybean that were acceptable traditionally in our food systems and interact with the rural household to uncover simple technologies that will fit their own life style.”

The main obstacle in the research was the negative perception of soybeans. “The missionaries that introduced the crop in Nigeria in the early part of this century told farmers soybeans had a toxic component.’ The researchers had to erase that belief,

then prove to rural folk that soybean was nutritionally beneficial.

Osho recognizes the role of cultural factors in introducing new foods such as soybean-based products to Nigerians. “In the northern region they have a lot of cereals so most of the soybean technologies that we developed were to suit that part.”

She points to the fact that soybean originated in China and from there was introduced to other parts of the world, and that most of the technologies now in use were borrowed from China and the Asian sub-continent. “Drinking soybean milk is a typical Asian habit, which we are now adopting in Nigeria.”

Osho and her husband, a biometrician, met as students in the United States. They have three boys. “I am married to a very understanding person,” she explains. “He is also a researcher, works in the University of Ibadan and knows the dedication that research requires.” He assists her in the documentation of her work and statistical analysis.

Osho envisages a great need for developing countries to increase food production levels. But for now, what is paramount for the Nigerian researcher is the sustainability of the soybean project. The next challenge is to develop strong research programs with national institutions in other African countries. Her achievements in Nigeria could serve as a springboard for spreading her experiences to other parts of the African continent and even beyond.

Susan Eshett is a correspondent for NTA News, Nigeria.



IDRC/S. Colvey

Eusèbe Alihonou

“Serve. First serve the most disadvantaged and the poorest.” That is the philosophy of physician and professor Eusèbe Magloire Alihonou of Benin, whose hard work and determination have made him a notable success in the field of development research.

Alihonou has had a long career in community health research. As director of a health research centre and Dean of the Health Sciences Faculty at the University of Benin, he has a deep and abiding concern for the future of his country. He is particularly aware of the importance of youth and how, with proper education and development, they can become the effective leaders of tomorrow. Alihonou has proven that good health care need not be expensive but that it does require the full participation of the community.

As his 60th birthday approaches, Professor Alihonou is clear-eyed and seemingly unconcerned, wearing a permanent, assured smile. He has astute observations on many issues and listening to him, one quickly finds oneself inside the mind of an intellectual.

Eusèbe's mother was a midwife who travelled the communities of her native land on a

succession of assignments serving the most disadvantaged classes of society, watched by her son whom she invariably took with her on her travels. In this way there grew within this future physician a social calling and a desire to help others. At Victor-Ballot College in Porto-Novo, where he went to high school, young Eusèbe flourished under the guidance, faith and rigorous training of his teachers, of whom he still says, with great admiration, that they were “learned, even if they lacked any impressive degrees”. Later, he went into medicine and graduated in 1969 from the Faculty of Medicine, University of Senegal in Dakar.

Alihonou returned to Benin in 1971 as a specialist in gynaecology and obstetrics, but this did not seem to satisfy his need to help others. “Once I was back in my own country, I started working in the maternity hospital in Cotonou. I was working very hard; however, I realized at the same time that I was only reaching a tiny fraction of the population. I concluded that I had to do something which would allow me to help more people. And in order to achieve this noble goal, I had to leave the hospital.”

“I could see that Benin as a nation was regularly squandering resources because of inefficient management. To maximize the impact of our meagre resources, we Beninois had to learn better management skills and learn to use appropriate, less costly solutions. In order

To maximize the impact of our meagre resources, we Beninois had to learn better management skills and learn to use appropriate, less costly solutions.

to achieve this, it was necessary to focus more closely on the countryside, where the majority of the population lives and where living conditions are very poor. This is how I came to work in rural communities."

Alihonou's approach in working with communities is not to proceed with unilateral action ... for that invariably leads to failure; instead, he and his team began by asking the people what their health problems were.

"People told us: 'We need roads so we can get our pregnant women to health care centres quickly. We also want to learn to read and write because, if we can read, we will understand many things more quickly on our own and can then help each other.'" At this point, he says, it became clear that improving the health of the people invariably led through other stages of development. Hence the closeness of the link between health and development.

"You can do a lot with little, provided you have the determination, courage, perseverance and expertise," he says. The Primary Health Care Strategy (PHC), for example, the implementation of which led to the famous Bamako Initiative, was designed on the basis of this philosophy. Everything began with a modest project in 1983 in the little village of Pahou, 20 km west of Cotonou: the Pahou Health Development Project.

"We began", recounts Professor Alihonou, "by using, under their generic name, the essential medication for oral rehydration and vaccination recommended by UNICEF. This enabled us to save an incredible number of children. In 1985, the Benin Ministry of Health incorporated the results of the operation in a national health care program, which gave birth to the Expanded Vaccination/Primary Health Care Program (known under its French initials as PEV/SSP). The program was subsequently extended to Guinea and other countries in the West African sub-region, and ultimately became the Bamako Initiative, which has continued to flourish due to the confidence which the international community finally placed in it. Today, the entire world believes in this initiative, and this has provided all the countries in this part of Africa with public services which are used by an ever-increasing percentage of the population."

Initially set up to implement primary health care in the areas of services, research and training, the Pahou Health Development Project, after it generated the Bamako Initia-



IDRC/S. Colvey

Physician and professor Eusèbe Alihonou is director of the Regional Health and Development Centre (CREDESA) and dean of health sciences, University of Benin.

The degree of participation by each element in the dialogue depends on the educational level in the communities: hence the need to provide schooling for 80 to 90% of school age children. This will endow communities with genuine autonomy in acquiring useful knowledge. In order for this process to reach full fruition, however, there is a 10 or 20-year waiting period ...

tive, was rapidly overtaken by its own dynamics.

At Alihonou's urging, and in close cooperation with the population it serves, the project's management and research team expanded the scope of its activities to include the development dimension. In 1989, the project was remodelled into a Regional Health and Development Centre (CREDESA) whose research and training programs both IDRC and CIDA have supported.

CREDESA is thus a tool of economic and social development which uses a multidisciplinary approach based on inter-sectoral cooperation: sociologists, agronomists, economists, doctors, nurses, midwives and social workers.

The key to CREDESA's success lies in the ability to make the tripod of decision-makers, professionals and communities work on solving a range of problems: setting priorities, choosing solutions, implementing them, evaluating the results and programming. Hence the necessity for an ongoing dialogue between the three elements of the tripod. The degree of participation by each element in the dialogue depends on the educational level in the communities: hence the need to provide schooling for 80 to 90% of school age children. This will endow communities with genuine autonomy in acquiring useful knowledge. In order for this process to reach full fruition, however, there is a 10 or 20-year waiting period before everything functions in a sustained, rigorous manner with the players involved having adopted a spirit of self-denial and sacrifice. It is precisely this which is not always easy to achieve.

For Professor Alihonou, it is a question of patience and courage, qualities which he possesses in the fullest measure. With one eye to the future, he works with a number of talented young people trained in top universities, most of whom speak French and English, who will eventually become his successors.

Alihonou has boundless faith in the youth of Africa, and of Benin in particular. "If you help the young people of Benin, they can succeed. I have fought to provide young people with conditions conducive to acquiring knowledge and they have astounded me."

Alihonou also maintains an unshakable faith in the genius of his people. He unhesitatingly cites as an example the peaceful transition of his country from a Marxist dictatorship to a democracy as additional proof of the intelligence and genius of Benin's people.

Jérôme Bibilary is a journalist in Benin.

Hosny El-Lakany

Hosny El-Lakany is a man who has always appreciated challenges in his 30-year career as a forestry scientist. From the days of his research for a Master's degree to his current post as Director of the Desert Development Centre of the American University in Cairo, difficult assignments have inspired him to forge new models for mixing forestry and agriculture.

Widely respected for advances in forestry that are applied in the dry areas and deserts of Egypt and beyond, El-Lakany's affinity for the natural environment goes far beyond a professional interest. "I love the tranquility of forests and deserts," he confesses. He attributes this fondness to his childhood memories. "I was brought up in Damanhour, a rural-flavoured area south of Alexandria where there was greenery and peacefulness."

One of El-Lakany's earliest research challenges arose in the course of obtaining a M.Sc. in Forestry — the first such degree ever granted in Egypt — in the mid-1960s. His task was to identify trees that could survive in degraded land that had become highly salinized from irrigation. He succeeded in selecting and growing trees in what was otherwise unproductive land. The accomplishment was regarded as innovative and important pioneering work. And the few hundred acres that El-Lakany planted with different wood-producing trees were just the beginning of a new agriculture methodology that has become a common practice in Egypt.

In 1966, El-Lakany was awarded a grant to study forestry at the University of British Columbia in Canada. In three year's time he obtained his doctorate in forest genetics, still a relatively new science. He then completed three post-doctoral fellowships in Canada. Although his experience in Canada had been rewarding, El-Lakany had concerns that he would not be fully accepted in a western country as a forester. These concerns, along with a desire to apply his knowledge in his native land, brought El-Lakany back to Egypt in the early 1970s.



Internationally respected forest scientist Dr. Hosny El-Lakany is Director of the Desert Development Centre in Cairo.

Hosny El-Lakany

El-Lakany's wife, Safaa Hamdi, now a professor in the Faculty of Agriculture at Alexandria University, also wanted to return home. After obtaining her M.Sc. and Ph.D. in Canada she said "I felt I should be teaching in an Egyptian university for Egyptian students."

The El-Lakany family re-established itself in Egypt, raising a son, an engineer who is currently studying in Canada, and a daughter who studies economics at the American University of Cairo. El-Lakany resumed his relationship with Alexandria University, one that has consumed the largest part of his career. He was eager to share the knowledge of forestry acquired in Canada with his students. "He is always keen on learning and teaching new things," says Mohamed Sabbah, an academic colleague and life-long friend of El-Lakany. El-Lakany advanced from assistant lecturer

in 1972 to department chair in 1983. In 1988, his work in applied forestry took him to the Desert Development Centre of the American University in Cairo.

At the same time as he carried out his teaching duties, El-Lakany pursued new research challenges. Chief among them was the quest to improve the qualities and applications of a particular tree that became central to his work: casuarina. A very hardy tree, casuarina is capable of fulfilling a diversity of agricultural purposes: it allows the creation of a forest in the middle of a desert and tolerates other more water-consuming trees nearby. It also tolerates many environmental problems, especially in areas suffering the effects of desertification. Casuarina is used by Egyptians in establishing windbreaks to protect farms and settlements.

Although windbreaks — growing a ring of trees around a field — are not new, there is always room for introducing new techniques, according to El-Lakany. Specifically, El-Lakany hoped to develop the aerodynamic qualities that make windbreaks most effective. His goal took him in the mid-1970s to Australia, the native country of casuarina. "I

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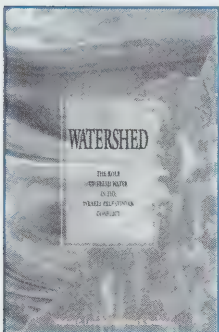


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Los efectos de la propiedad intelectual en el comercio,
la diversidad biológica de plantas y la sociedad rural

por El Crucible Group



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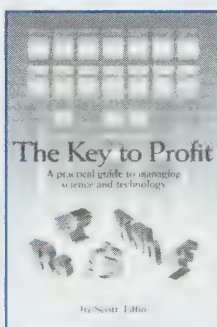
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had the feeling that the species in use was not the best we could get," says El-Lakany. His research found support from IDRC. As a result of his work with casuarina, "he has become well-known nationally and internationally," says Fawzy Kishk, regional director of IDRC in Cairo.

El-Lakany's major achievement with casuarina was to grow it using saline water. Indeed, he developed the farming of casuarina in Egypt, specialists say, as well as sparking interest in the tree among graduate students at Alexandria University.

In the early 1980s, El-Lakany began to apply his forestry expertise to a pressing problem in Egypt: agricultural development of desert areas. Fully 96% of Egypt's land is desert. These areas offer some hope for relief from the economic and social pressures besetting the Nile Valley, where almost the entire 60 million population lives.

El-Lakany began working with the Desert Development Project — later to become the Desert Development Centre (DDC) — of the American University in Cairo. In 1993, El-Lakany took on the directorship of the Centre. The focus of the DDC was an area of degraded land in El-Tahrir, some 100 km northwest of Cairo, that the Egyptian government wished to see reclaimed. El-Lakany's experience in El-Tahrir was new in the sense that it took him from the very wet environment of British Columbia to a very dry setting in the middle of the Egyptian desert.

The biggest mission for the DDC is to improve the social and economic well being of new desert settlers. According to Andrew Kerek, provost of the AUC, El-Lakany tackled this mission in three basic ways: training of potential farmers, investigating environmental impacts, and pursuing water-use efficiency.

In El-Lakany's view, the desert program is able to take advantage of two factors: one is the presence of creative and efficient technologies that have evolved over the millennia in Egypt and the Arab world and that are suited to the region's harsh conditions. Second are the equally creative and sophisticated modern technologies that have been applied to agriculture, development of arid lands and harnessing of renewable energy.

Fundamental to the DDC's approach is that research and development programs should be technologically feasible, economically viable, socially acceptable and environmentally sustainable. "It is this integration and balance of indigenous methods with modern technology that makes the DDC program unique," says El-Lakany.

In El-Tahrir, working with some 60 agricultural experts, farmers and administrators, El-Lakany has so far planted about 300 feddans (one hectare equals about 2.5 feddans).

Sixty of the feddans are planted in a forest of casuarina and Eucalyptus. Some of the remaining 240 are planted with citrus fruits. The rest are planted with fodder where animals are also bred to help fertilize the soil. The farmed lots are split into 20-feddan divisions. In each one, a different agricultural and irrigation system is being experimented with.

El-Lakany regards his major contribution to forestry as the introduc-

tion of new methods of desalinating land and installing windbreaks. But he is the type of individual who is not content to rest on a reputation of past accomplishments. El-Lakany is already moving ahead with his latest research challenge: to find methods of reclaiming land and building windbreaks with minimum water consumption in an environment where each drop of water is invaluable.

Dina Ezzat is a Cairo journalist.

El-Lakany is already moving ahead with his latest research challenge: to find methods of reclaiming land and building windbreaks with minimum water consumption in an environment where each drop of water is invaluable.



IDRC/Maria Antonia Martinez

After decades of painstaking banana breeding, Franklin Rosales experienced a recent breakthrough with the development of the "Goldfinger" banana which is disease-resistant, nutritious and eco-friendly.

Franklin Rosales

The career of the agricultural researcher can at times be stimulating and rewarding, but years of dedication, effort and hope can also lead to failure if the research takes a wrong turn along the way. Franklin Rosales knows he is one of the fortunate ones among scientists.

Rosales, a plant breeding specialist in Honduras, has dedicated 17 years to agricultural research, most recently in the area of genetically improved bananas. He shares a recent breakthrough with colleague Philip Rowe, both of whom are now known worldwide because they have been able to breed a banana that is nutritious, good tasting, environmentally friendly and disease-resistant.

After decades of painstaking breeding, FHIA-01 — or "Goldfinger" as the world will come to know it — is the first banana variety ever bred that could replace the standard Cavendish banana. It may well save the world's banana export industry from collapse as diseases take an unsurmountable toll. More important yet, it could ensure reliable food supplies for the millions of people in Africa, Asia and

Latin America for whom bananas and plantains are staple foods.

Rosales, 46, comes from a large lower middle-class family that moved from southern Honduras to La Lima, near the northern city of San Pedro Sula, the country's second largest city, when he was a young boy. Shortly thereafter, in 1954, workers at the American-owned United Fruit Company — today United Brands — began an historic strike in La Lima that led to major changes in the labour laws of the country. Violence associated with the strike caused many families to leave the area, including the Rosales family, who moved into San Pedro Sula. Many years later, Franklin Rosales' choice of profession would lead him back to La Lima and a research position with the Honduran Foundation for Agricultural Research (FHIA).

Rosales' career in agricultural science began almost by accident. As an adolescent, Rosales was inclined toward mathematics — a skill he inherited from his father who taught math in school — and planned to pursue engineer-

ing or architecture. But on a whim he decided to write the entrance exam to the Panamerican Agricultural School. A month later the school informed him that he had won a scholarship for agronomy studies. He graduated as an agricultural engineer in 1968.

After further studies in Switzerland, Rosales worked for the Honduran Natural Resources Ministry as an agricultural extension officer. His work took him for two years to Puerto Cortés on the Atlantic coast. There, Rosales met his wife of 22 years, Pacita Williams. They have a son, 19, and two daughters aged 18 and 12.

Rosales spent much of the 1970s studying in the United States, gaining Bachelor's and Master's degrees in agronomy from New Mexico State University and a doctorate in plant breeding from Oklahoma State University. His studies were followed by research postings in Honduras, Costa Rica and Jamaica.

In 1986, Rosales signed on with the Honduran Foundation for Agricultural Research as a plant breeder in the banana and plantain improvement program. The program, supported by IDRC and other donors, continues an initiative begun by the United Fruit Company as early as 1959 to find new banana varieties resistant to diseases. Rosales' American colleague, Dr. Philip Rowe, is the program coordinator.

Rosales spends a few hours each day at his office at the FHIA headquarters in La Lima, but most of his work is done inspecting leaves in the banana groves nearby or at the Guarama Uno laboratories, monitoring the progress of new hybrids and implants.

The development of the new Goldfinger banana was a lengthy process for Rosales and his colleagues, requiring years of patient, careful experimentation and observation. Although bananas and plantains are easily multiplied by replanting sprouts from mature plants, the biggest difficulty in breeding new varieties is that commercial varieties lack seeds. Therefore, breeders must rely on wild or other varieties that may be poor for eating but do produce viable pollen or seeds. The wild varieties may also have other desired qualities such as disease resistance that can be crossed with standard varieties having good eating qualities. FHIA's program drew on a gene pool of over 800 cultivars collected in Southeast Asia, from where bananas originated.

Pollinating the flowers is a difficult, painstaking process that requires workers to pollinate each flower by hand at first light of day before the sun dries out the pollen. When the bananas are harvested three months later, they are peeled by hand, mashed in a press developed by Dr Rowe, and passed through a sieve. This messy, laborious process eventually yields one or two seeds per bunch, about half of which are successfully germinated to produce young plants.

During the years leading up to Goldfinger's development, thousands of hybrid plants were cultivated. Only a few survived the rigorous selection process that weeded out any plants susceptible to disease. The first big breakthrough came in 1977 with the development of a hybrid that had good bunch size and was resistant to burrowing nematodes — a widespread pest controlled by potent, expensive pesti-

cides — and to Race 4 of Panama disease. The latter is a deadly soilborne fungus that wipes out crops and cannot be controlled by existing fungicides. Crossed with a female Brazilian apple-flavoured 'Dwarf Prata' clone, the new hybrid showed good resistance to Black Sigatoka, a fungal leaf spot disease that can cut fruit production by half and causes premature ripening. This resistance to Black Sigatoka was an especially important feature, because the disease has spread through plantations around the world. It can be controlled only by environmentally damaging applications of fungicides. And the cost of the fungicides is a financial burden that has forced many small farmers to withdraw from production.

Other qualities that made the Goldfinger banana stand out for the FHIA team are its productivity and suitability for smallholder production in areas where traditional varieties do not grow. To top things off, Goldfinger has a flavour that is proving popular with consumers, it ships well, and the fruit ripens slowly.

As rewarding as scientific research has been for Rosales, it is not the most important aspect of his life. "For me religion comes first, then my family and then my work," says Rosales. He and his wife travel every two weeks to the town of Santa Bárbara in the western part of Honduras, where they visit a friend, Spanish priest Enrique Silvestre, who came to the country 25 years ago as a missionary. Over the past five years, Rosales has established a community agricultural program there aimed especially at women and children that has drawn praise from residents and visitors alike. "It is our way of contributing. We teach people in the villages how to grow food so they can help themselves survive, but at the same time we are helping Father Enrique in his mission."

While he maintains his strong devotion to church and family, Rosales also continues his own scientific mission. Apart from Goldfinger, Rosales and his colleagues have developed two other promising banana hybrids and are pursuing new high-yielding, disease-resistant plantains. In the words of Rosales: "The work of the researcher never ends. We must go forward, what we have is not sufficient. We have to look for new and better varieties."

Maria Antonia Martinez is a journalist in San Pedro Sula, Honduras.

Lorena Aguilar

From Costa Rica, Lorena Aguilar Revelo pursues a professional mission inside her small country and around the globe. Her goal is to demonstrate that real community participation is a vital step in achieving sustainable development.

After a decade of intensive field research in the rural communities of Central America, Ms. Aguilar has gained considerable recognition as a messenger for a new way of working with communities. Her method is to integrate gender research, participative methodologies and sustainability.

This 34-year-old woman, the mother of three children, is considered by her colleagues to be a tireless and creative professional who has made important contributions to research on development. Apart from her valuable professional contributions, she is appreciated for her personal style in her work with communities, described as the "warmth of friends" in the words of one small farmer in Costa Rica.

Lorena Aguilar's academic credentials include an undergraduate degree in anthropology from the University of Costa Rica (1980) and a Master's degree in anthropology with a specialization in cultural ecology from the University of Kansas (1982). Currently, she is Regional Director for Latin America of the "Asociación Internacional sobre Sistemas de Abastecimiento de Agua de Lluvia".

Aguilar's views about the critical importance of participatory methods in development research were solidified through her experiences in several peasant communities in the north zone of Costa Rica. Between 1986 and 1988 these communities participated in the project "Technologies for Water Supply," financed by IDRC, to evaluate the adaptability of a manual water pump in rural communities. Aguilar's role was to develop methods to ensure community participation and give training workshops on organization, administration, health and environmental sanitation.

Following success in that project, Aguilar became principal co-researcher in a larger project, also financed by IDRC: "Participatory Strategies for Water Supply."



Her experiences working in peasant communities in northern Costa Rica convinced Lorena Aguilar of the critical importance of participatory methods in development research.

Community integration

The main principle that has guided her research has been the full integration of communities during all stages of projects. The work is always done with men, women, youth and children, learning about their needs, roles, and responsibilities and defining goals in agreement with the researchers.

According to Aguilar, we cannot talk about sustainable development without having in mind the immediate improvement of living conditions, the establishment of mechanisms of equality and, above all, that local men and women should be trained as promoters of these ideas to their own communities.

In her view, projects should be born, executed and evaluated by local people. The role of technicians

should be simply to provide knowledge in areas where the communities feel weak in order to carry out the project objectives. Researchers must know they are only "facilitators" who in the end will be discharged. Knowledge must be transmitted to locals as soon as possible, so they can assimilate and transmit the ideas to their own people, in a two way communication process. We have seen, she explains, that when knowledge is communicated by a local instructor, the level of assimilation is higher than when it is transmitted by an outsider.

The creativeness of her research programs in Costa Rica motivated IDRC to provide the means for Aguilar to spread her knowledge to other countries. Through conferences and workshops in Canada, Central America and the Caribbean, Malaysia, Morocco, the Philippines and the United States, she promoted the importance of incorporating participatory research in sustainable development projects.

Besides IDRC, other international organizations have been interested in the experience of this researcher. Therefore, she has been a consultant of the German Agency for Technical Cooperation (GTZ), the International Red Cross, the Tropical Agronomical Centre for Research and Education (CATIE) in Costa Rica, the International Technology Agency, the World Health Organization, CARE International, and the World Conservation Union.

Despite growing interest in participatory methods in development, Aguilar observes that many agencies are directed by technicians who do not always accept that social phenomena are a fundamental aspect of development programs. She questions the fact that many resources end up in the hands of people who claim to be working for development, but who have become a kind of international mafia living on development funding. There is often no interest in incorporating community participation. Researchers and professionals involved in development programs do not always like field work. However, Lorena Aguilar believes there is a great need to go back to fieldwork.

Her own professional development in community participation was not straightforward. There was little literature on the topic when she began. She and her colleagues had to solve problems as they arose since they were executing projects that had been planned from a technical perspective. Collaborating with a multidisciplinary team presented its own challenges and compromises. Now, Aguilar tries to share her experiences both with younger researchers and established peers, hoping to spark greater interest in the benefits of participatory methodologies. Her commitment to this approach has come at the cost of some criticism for dedicating too much time to her work and, in the process, sacrificing her family. She says she has overcome these criticisms mostly because of the strong support of her husband Eric, a graphic designer and teacher.

Gender

In the course of her work, Lorena Aguilar has formulated her own views on gender and development. Some theorists in this area insist that reforms be centred primarily on satisfying women's *strategic* interests. This approach is based on the assumption that projects aimed at satisfying women's *practical* needs usually reinforce traditional unequal relations between men and women, whereas a focus on strategic interests can create more equal relations over the long-term.

Lorena Aguilar's position is that women's practical problems should be solved in the context of a strategic vision that combats female subordination. Given the poverty of the developing world, she says it would be contradictory to focus exclusively on strategic concerns when the population is struggling for its very survival. Our reality is one of men and women struggling to survive, fighting for daily food, for

education, housing, for better living conditions in general, says Aguilar. It is urgent that immediate answers to survival needs — where self-esteem is important — be found so that women feel capable of participating. At the same time, Aguilar recognizes that if larger questions — such as legal structures in Central America as they affect women — are not addressed, little can be done in this area.

Aguilar's most recent professional challenge is to attempt to incorporate the experience of local projects in national policies in order to promote community participation throughout the nation. In this as in her other endeavours, Lorena Aguilar's outlook appears to have been influenced as much by untutored farmers in villages throughout Central America as by her academic peers. "Constant invitations to conferences and workshops are important for my professional growth," she says, "but can never be compared to what I feel when I see the results in the communities. I see how people grow, and that my work has been useful. There is no doubt that if each one of us would learn to give a little more, things would be much different."

Jonathan Molina works for the weekly newspaper of the University of Costa Rica and for the Costa Rican Ministry of Culture, Youth and Sports.

"Constant invitations to conferences and workshops are important for my professional growth," she says, "but can never be compared to what I feel when I see the results in the communities. I see how people grow, and that my work has been useful. There is no doubt that if each one of us would learn to give a little more, things would be much different."

Pilar Cereceda

Returning to the tiny seaside village of Chungungo [pop. 330] in northern Chile is quite often an emotional experience for Pilar Cereceda, geographer at the University of Chile in Santiago. Fourteen years ago, Chungungo was one of hundreds of villages in the region without a local source of fresh water. The village sits in Chile's north coastal desert, just south of the Atacama, the most arid desert in the world. The inhabitants used to have water trucked in from 40 km away, at a cost of US\$8 per 1,000 litres. The average family had only fourteen litres a day, and during drier periods, just three.

Now, fourteen years later, an innovative fog catchment system, financed by IDRC and the Canadian Embassy in Santiago (with scientific support from the University of Chile and the Catholic University), provides the village with a fully functioning local water supply system. There is enough fresh water for household use, for growing vegetables and flowers, and even some agriculture.

The 'miracle' of clean fresh water for Chungungo came about through the introduction of large fog collectors, "a kind of volleyball net, which captures the fog (called *camanchaca*), typical of northern Chile," explains Cereceda who, together with Dr. Robert Schemenauer of Environment Canada, has directed and advised on the installation of these nets in other sites in Chile, Peru, Ecuador and the Arabian Desert.

The process involves the installation of polypropylene mesh nets, 12m long and 4m high, in the mountains above the village. Fog, a regular phenomenon in the area, passes through the mesh and leaves behind droplets that trickle down to a trough, which carries the water to a storage tank in the village. The 75 fog collectors built by the Chilean Forestry Service near Chungungo capture an average of 10 thousand litres daily. Chungungo has gone from being a struggling village to a prosperous community that even attracts holiday visitors.

The experience in the village helped Cereceda understand the importance of community involvement in any research project. "The participation of the community in learning to use water wisely and avoid needless waste is obviously very important since the quantity of water collected still varies with the weather conditions."



Pilar Cereceda inspects the fog collectors along the ridge at El Tofo, Chile.

P. Cereceda

Many other arid places in the world where clouds can be intercepted by mountains could benefit from this same system, says Cereceda. These include many areas of southern, eastern and western Africa, India, several countries in Latin America, parts of the Middle East, and the Philippines.

Contact with the most extraordinary people and cultures is one of the reasons why professor Cereceda confesses to an unconditional love of her work and of nature. Cereceda's career in research and teaching carries on the tradition of a family devoted to learning and knowledge. Her grandfather was rector of the Federico Santa Maria Technical University, one of Chile's most prestigious universities. Her father, a medical doctor, was a professor at the University of Chile. Pilar Cereceda herself is a

teacher of geography, history and political science. She has two daughters and one son. "My three children accompany me when I am doing field work and are real experts in my job."

Author of more than one dozen books on such topics as Chile's geography, environmental risks, and hydrography, Cereceda confesses that her most fulfilling accomplishment has been "helping make possible the 'miracle' of water, thus changing the quality of life of many families." Teaching also gives her immense satisfaction, especially going out to the hills with her students and teaching them geography on site.

Cereceda's dearest wish is to leave behind the pollution of the city and live in the countryside. She dreams of a more natural way of life and treasures beautiful memories of many trips to isolated but inspiring rural villages. "To be able to live in the midst of such peaceful nature would be incredible, even though there are certain sacrifices involved."

Maria de Luigi is a journalist in Santiago, Chile.

Palmira Ventosilla

“We hear that there are new ways to control malaria but that is hard to believe,” says Hernan Hermosilla, a farmer in Piura, 650 miles north of Lima. “And coming from a woman makes it very difficult to accept.”

Skeptical comments such as these are familiar to Palmira Ventosilla, a 35-year-old Peruvian microbiologist who, with her team of researchers, has developed a new way of controlling malaria through biological control of mosquito larvae.

Piura is a neo-tropical region, and Salitral, the town where Ventosilla's program is based, has a humid rainy season when ponds form everywhere and act as breeding grounds for anopheles mosquitoes. Inhabitants have learned to live with the fever, chills, nausea, and muscle pain of the malaria, but now many are also dying of it. A lethal variety of malaria, *Falciparum*, has been found in the area.

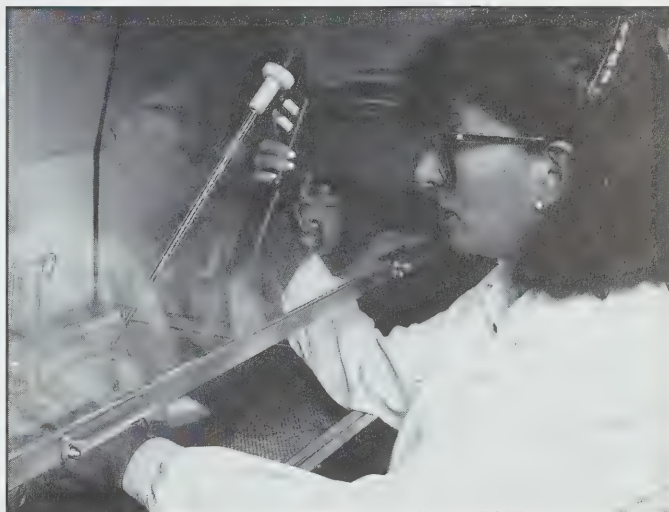
Ventosilla's new scientific breakthrough emerged from her proposal for a community-based method of controlling anopheles mosquito populations, which was funded by IDRC. Ventosilla and her colleagues at the Alexander von Humboldt Tropical Medicine Institute in Lima began their research and soon learned about *Bacillus thuringiensis var. israeliensis* H-14 (Bti), a naturally occurring bacteria that is harmless to humans and animals but kills anopheles larvae. It is commercially available but its cost can be prohibitive for developing countries. The team found a cheap way to produce Bti: growing it in coconuts and then releasing it into ponds where mosquito larvae flourish.

After the method was tested and perfected, the challenging task of local community implementation began. “This area lacks basic services; hygiene and health standards are rudimentary,” Ventosilla recounts. “People here do not like to hear foreigners tell them how to change their lifestyles. In our dealings with the local community, we have learned to proceed with understanding and care.”

This sensitivity and concern for others has been part of Ventosilla's makeup from an early age. Born in Lima in 1959, Palmira travelled to Cerro de Pasco, in the Peruvian sierra, when she was seven years old. Memories of the poverty of the rural folk remained with her. When she chose biology as a major, a key factor in her decision was her desire to help the people she had met as a child.

While adults in Piura were skeptical about participating in the new program for malaria control, Ventosilla found that their children were much keener. An educational program using comics, posters and games — developed by Ventosilla's colleague Jorge Vélez — provided the children with clear information about the malaria and the anopheles mosquito breeding cycles and Bti production.

Two other team members — Lucy Harman and Mark Snyder — worked on information sessions designed to reach the adult population. But the adults were not eager to



IDRC/Jorge Martin

Microbiologist Palmira Ventosilla's innovative community-based malaria control programs are achieving good results.

accept the fact that malaria could be controlled by limiting anopheles larvae populations.

Children, on the other hand, proved to be brilliant teachers. After learning the technique, they demonstrated to their families its effectiveness and low cost in time and money. Eventually, parents began to pitch in and help. Several short videos were produced and used to animate community meetings.

The entire community has now been reached, and all three major schools of Salitral are ready participants. “Next year, we would like to cover more schools, more towns and more ponds. Other communities are very interested in participating in this type of project”, says Ventosilla.

“We cannot hope to wipe out malaria completely from our country — because of the prevailing climate and terrain — but if local families are able to kill the mosquitoes in their backyard, the chances of them or their families contracting malaria become slimmer,” says Ventosilla. “We need to prevent an epidemic, and the solution is in our hands, and in that of the community”.

Antonio Zighelboim is a Peruvian freelance writer and translator.



León Velarde

Leon Velarde appears to have acquired some of the qualities that he so admires in the Peruvian peasant: patience, long-term planning and understanding, qualities essential to effective research in this part of the world.

Carlos U. León-Velarde

"Anyone who knows a Peruvian peasant cannot be pessimistic...."

The words of Andean writer José Maria Arguedas allow Carlos León-Velarde to express his admiration for the peasant farmers of Peru's *altiplano*, or highland plateau, in the Andes Mountains. There, a sudden drop in temperature can produce an unexpected frost, wiping out crops and the expectations of entire communities. Such extreme climatic changes are an enemy that could drive anyone but a Peruvian *comunero* (member of a peasant community), or León-Velarde himself, to despair.

Carlos León-Velarde heads an interdisciplinary team in the "Sustainable Highland Agriculture Project" (or PRODASA, the Spanish acronym) in Puno, southeastern Peru. The team has made notable achievements in alternative proposals for the improvement of agriculture and alpaca raising in the high plateaus near Lake Titicaca, one of the most difficult farming regions in the world. At four thousand metres, in a cold and cutting wind, hundreds of communities contend against the unpredictability of nature.

León-Velarde says the project will help small farmers emerge from their current survival economy and build a base for sustainable agricultural production, which will allow them to sell their surpluses.

It was only a few years ago that León-Velarde decided to join his knowledge and experience with that of the Puno peasants, among whom he is now held in considerable esteem. He is not a native Andean, but was born some 45 years ago in the warm city of Iquitos, the major Amazon city in Peru.

León-Velarde enjoyed a childhood on an Amazon farm among bulls, cows, hens, and pigs. It seemed inevitable that he would follow the path of his father, an engineer and farmer. In 1969, León-Velarde graduated from the National Agrarian University in Lima as a specialist in animal husbandry. Then came the opportunity of obtaining a Master's degree in animal production at the Interamerican Institute of Agricultural Science of the Organization of American States in Costa Rica. León-Velarde stayed with the Institute in Costa Rica as a professor of the Costa Rica University, then served at another project of the InterAmerican Institute of Agricultural Science in the Dominican Republic.

He returned later to the CATIE (Centro Agronomico Tropical de Investigacion y Ensenanza) in Costa Rica. León-Velarde went abroad once more in 1987 to begin a doctoral program at the University of Guelph, in Canada, under IDRC sponsorship. Again the focus was animal production, with an emphasis on genetics and analysis systems, simulation of models and the application of recent developments in agriculture systems.

After graduating he began work as liaison officer between IDRC, the Canadian International Development Agency (CIDA) and the Andean Agricultural Research Systems Project. Both IDRC and CIDA had been involved in projects in southern Peru, particularly in Puno. IDRC wished to join forces with other institutions such as the International Potato Centre and the National Institute of Agricultural Research (INIA) in order to maximize benefits by sharing experiences and, above all, research.

This collaboration was the beginning of the Sustainable Highland Agriculture project. For León-Velarde, one of the major challenges has been establishing good working relations with local farmers. "Relations with the Andean *comuneros* are not easy. A big cultural gap separates us, and both sides put up obstacles that are difficult to eradicate. But sharing the work, everyday life, and living in the same community most of the time helps to overcome such barriers," he says.

Three peasant communities located in the province of Ilave in Puno were chosen for the project: Jiscuani, Santa María and Apopata. "The challenge is to take the methodology and the results obtained and use them elsewhere in the Andean area to prevent the perpetuation of poverty. A Puno peasant has an average annual income of about \$220 and without cooperation the production levels will continue to decline with effects to be seen in the long run. We should not let them depend on the project, but rather stimulate sustainable growth so that the work may be continued when I and the other technicians leave."

The initial objective of PRODASA was to gather information and data, identify problems, then offer alternatives to peasants in close collaboration with professionals, technicians, and representatives of local organizations. The project also aimed to train technicians, and finally, to disseminate the results in the Andean area and other regions with similar ecological problems.

In this process, León-Velarde is conscious of the value of the farmer's indigenous knowledge. "We cannot disregard the wisdom acquired by these peasants over the years. We have figures on rains, on floods, but they observe that the birds that build their nests on the banks, always do it in places that cannot be reached by the water. It is necessary to harmonize what they already have with the alternatives we propose," says León-Velarde.

The alternatives must also take into account the age of the *comuneros* and their strength to carry out the work, says León-Velarde. "Owing to very complex national problems, very few peasants are aged between 15 and 35. Young people leave the country for better opportunities in big cities, thus reducing the capacity required to work a unit. Great attention should be put on peasant women as a major element in the development process of a community."

The complex mix of animal husbandry and crop production in the region has prompted León-Velarde and his team to pursue a range of strategies for raising the productivity of small farmers. These include the use of "manure mud" in potato cultivation, rustic greenhouses made of locally available materials, raising trout in artificial ponds, as well as

guinea pigs and poultry, improved methods for raising alpaca, and developing markets for alpaca meat and wool.

Not everything runs smoothly in the project. Beginning some 13 years ago Peru, and particularly Andean peasants, had to face the threat of the Shining Path guerrilla movement. In addition, there are factors from the world beyond the *altiplano* to consider. "We cannot restrict our work to the internal problems of the producer or the community, ignoring external issues. We are studying the characteristics of the free market because we have to provide advice to the peasants on the market, on prices," says León-Velarde.

When in Lima, León-Velarde works in a small office at the International Potato Centre. He prepares reports, plans trips and lectures for seminars, participates in electronic computer conferences, and writes articles for journals. He is constantly asked for information on PRODASA because the success of the project has transcended frontiers and it is likely that similar alternatives can be applied in Ecuador and Bolivia, and in other parts of the Andean zones of Peru.

"I try to spend most of the time in Puno, near the work. I fly into Juliaca and then travel by road to the communities. I have to share my time between the project activities, the *comuneros* and my family," says León-Velarde. In some ways, León-Velarde appears himself to have acquired some of the qualities he so admires in the Peruvian peasant. He observes that in this type of research patience, a long-term horizon and understanding are what are needed.

Juan Gargurevich is a journalist and an associate professor at the University of San Marcos in Lima.

Alfredo Riesco

"I have always been interested in other disciplines of human knowledge, especially in those about which I know little, but that are important for my work," says Alfredo Riesco. This curiosity and openness are perhaps the secret behind Dr. Riesco's success in the area of agricultural economy in Peru.

For Riesco, it has never been difficult to bring together specialists from many disciplines to participate in a specific project. This approach has served him well for many years and in his current work as director of the Sustainable Amazonian Systems project, based in Pucallpa in the Peruvian jungle some 800 km. east of Lima.

Born in Lima 50 years ago, Riesco graduated from animal science studies at the National Agrarian University (UNA) in La Molina, Peru, when he was 21. His attraction to animal sciences sprang from a fondness for farming and country life that began when he was a boy. At that time, his family moved to La Oroya, a mining town in the Andes, surrounded by rural landscapes and not far removed from the tropical forests of the Amazon. Riesco remembers clearly the long family walks through villages at altitudes of 3,000 metres and the enjoyment he felt being around animals.

His first professional position was with the experimental research station of the Veterinary Institute for Tropical and High Altitude Research (IVITA) of San Marcos University in Pucallpa. This Amazonian city marked his life, not only because his work there led to great professional development some years later, but also because he met his wife there (they have two daughters and two sons) as well as most of the people who have had a strong influence on his life.

In Pucallpa, Rosales became something of an expert on the suitability of different grasses for pasture and fertilizer in livestock production. At the same time as he deep-

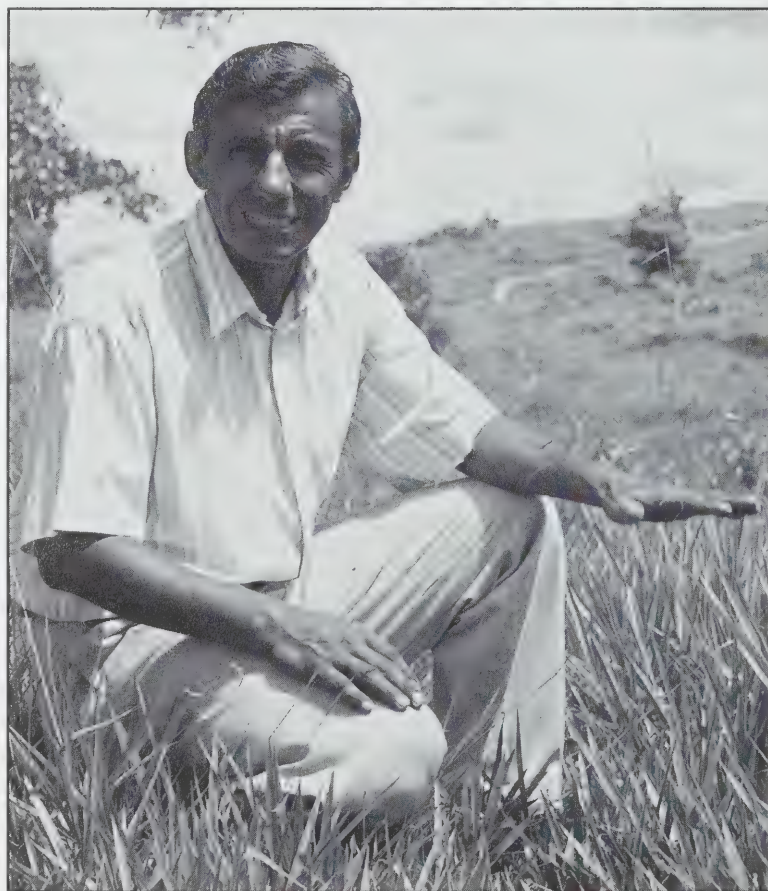
ened his technical expertise, Riesco began to see the real need to look beyond his own specialization to the economic factors that influenced farmers in their production decisions. "I realized the importance of economy because this is the discipline that can integrate the whole system," he recalls.

Riesco's exchange of ideas about economy with field specialists convinced him of his need for further training. He went to Oxford University where he earned a Master's degree in agricultural economics in 1978. At the Grasslands Research Institute, also in England, he was exposed to the idea of integrated systems in farm production and the need for research to be guided by overall objectives rather than the narrow confines of particular specializations.

In the years that followed, Riesco's approach to research underwent a gradual evolution toward a clearer focus on objectives established at the outset of research. He began collaborating with another Peruvian agricultural researcher, Jose Toledo, with whom he received support from IDRC for the Amazon Production Project. By 1983, their research efforts were oriented specifically toward small producers. It

was a major shift that meant the researchers had to leave their laboratories and interact more closely with small farmers to ensure that their research results would be useful. "Results could not be hard to understand and we had to go step by step, bearing in mind that we were no longer working with big producers but with small farmers who had little money," recalls Riesco.

Riesco and his project collaborators also had to overcome the mistrust of small farmers who had grown weary of neglect by the government. There was even resistance to the new approach from within IVITA itself, where some scientists argued that the organization's



IDRC/Enrique Pretell Casana

Alfredo Riesco: "I now think that the transfer of technology is a two-way process in which both the producer and the researcher learn."

fundamental objective should be research rather than the transfer of new technologies proposed by Riesco and his colleagues. Once he did begin working with farmers to introduce new grasses, breeds of cattle, and agricultural methods, Riesco came to an important realization: “Now I think the transfer of technology is a two-way process in which both the producer and the researcher learn.”

Riesco feels that one of the most important new crops he helped develop is the grass legume *Stylosanthes guianensis* ‘Pucallpa.’ The legume — valued for its use in soil improvement, as a nitrogen-fixing legume for cover crops, and as animal feed — emerged from the work of the International Centre for Tropical Agriculture (CIAT) and IVITA. Riesco had an important part in developing Stylo Pucallpa but insists that it was the product of a team, including the efforts of Cesar Reyes, Hugo Ordonez, Jose Toledo, and the late Jose Diez Matallana. Stylo Pucallpa is now part of farming systems not only in the Peruvian Amazon but in Brazil, China, Colombia, Costa Rica, Puerto Rico and Venezuela.

In the late 1980s, Riesco embarked on another milestone in his professional development — a doctorate in agricultural economy at Iowa State University, supported by IDRC. His thesis research, an econometric analysis of factors affecting the adoption of technological innovations, was hampered by political violence in the Pucallpa region. A few months after he began his survey of agricultural producers in the area, the terrorist group Shining Path destroyed the IVITA research station at Pucallpa. Students, colleagues and friends of Riesco lost their lives during this period, one which he notes left its mark on the country. Nonetheless, Riesco believes the research community has come back today with more strength than ever.

Apart from his research activities, Riesco devotes much of his time to teaching at San Marcos University in Pucallpa and in Panama through a program organized by Iowa State University. He also carries out consultancies for agencies such as CIAT, FAO, the Foundation for Agrarian Development (FUNDEAGRO) and IDRC. Professional life is not everything for Riesco, who admits to being more a private than a public individual. He has a small property in Pucallpa where he raises animals — his favourite hobby — and he enjoys playing basketball, watching films, and spending time with his family.

In Riesco’s view, agricultural research is necessarily a multi-disciplinary endeavour that relies on sound social, economic and political research. “It doesn’t only consider better incomes for producers, but equity, so we can obtain

balanced growth, because without equity we cannot have sustainability.”

Riesco’s approach to equity and sustainability is one that reaches beyond national or regional borders. He points to the divergence of interests between the populations of the

North and the South, and even between different groups within the South. “When we speak about conservation of natural resources, we are not speaking about the same interests in the North and in the South. Agricultural producers [in the South] are worried about obtaining higher incomes now, and not within 40 or 50 years, whereas consumers will ask for cheaper prices for food.”

“We must ask the North if they are interested in improving the incomes of people in the South, if they will open

their markets to products exported from the South that will improve their way of life. If we work in this direction, we would realize how much comprehension is still needed between North and South.”

Zoraida Portillo is a Peruvian journalist specializing in agriculture, biodiversity and ecology.

We must ask the North if they are interested in improving the incomes of people in the South, if they will open their markets to products exported from the South that will improve their way of life.

Jose Antonio Ocampo Gaviria

Jose Antonio Ocampo Gaviria — economist, historian, researcher and politician — is by most accounts one of the most outstanding Colombian economic and social thinkers of the last 25 years.

Ocampo began the path to his present post as Colombia's minister of agriculture over 25 years ago when he enrolled in a Bachelor's degree program in economics and sociology at Notre Dame University in Indiana during the turbulent 1960s. His doctorate came at another noted American institution, Yale University.

More than ten years were spent at the Foundation for Higher Education and Development (FEDESARROLLO), where Ocampo collaborated with IDRC on several macroeconomic research projects. He has also taught at Colombian universities and at Oxford and Yale.

In March 1993 Ocampo was appointed Minister of Agriculture in the middle of one of the worst crises in agribusiness in the country's history. However, he succeeded in reconciling such diverse bodies as the agricultural workers' organizations, business interests and the representatives of agribusiness.

Ocampo was born in 1952 in Cali, the second largest city in Colombia. He had a role model for public office in his father, who from the mid-1950s held ministerial offices. From his mother, who introduced him to authors such as Jules Verne and Emilio Salgari, Ocampo inherited a love for reading. Later, Ocampo encountered the works of Sartre, Camus, Malaparte, Kafka and Teilhard de Chardin, who would help shape his humanistic development.

Ocampo also embraced the ideas of the guerrilla priest Camilo Torres along with the theologians of Latin American and Dutch liberation. "I wanted to be a priest but a vocational counsellor convinced me to wait and enter university. I discovered that economics combined several of my interests with the social themes that were important to me."

Ocampo belongs to the generation of '68. "I entered university exactly 25 years ago," he recounted. "Not everything surrounding university life at that time was a success." One negative example in Colombia was "the growth of an absurd guerrilla movement whose dead weight we have not been able to overcome." Ocampo prefers to recount the positive features of his student generation: a critical mentality, the possibility to dissent, opposition to inequality and ecological depredation, and the capacity to dream for a better world.



IDRC/Germán David Hernández

Minister of agriculture in the Colombian government, Dr. José Antonio Ocampo Gaviria is a distinguished economist and award-winning author.

Among Ocampo's fifteen books are works on the economic history of Colombia, macroeconomics, inflation, foreign debt, industry, the coffee trade, external trade, development, the labour force, world depression and protectionism. Compared to the relative anonymity of academe, Ocampo is annoyed by the demands of public life. The pleasure of being able to walk through the streets without anyone recognizing you no longer exists."

He also laments the difficulties in trying to adequately combine work in the public sector with family life. There has been a high cost in the time he has been able to dedicate to his wife Ana Lucia and his three young children, he admits.

Ocampo would like to see the state less bureaucratic and more modern. He sees the advantages of a fair balance

between the private sector and an active state presence that corrects some undesirable outcomes of a pure market system such as inequalities of class, race and sex and the destruction of ecosystems.

Ocampo regards his own country as one with dramatic inequalities in access to wealth, education and work. "These are patent forms of inequality that continue to be part of our economic organization. Although their causes are multiple, there is not the slightest doubt that they are one of the most important causes of the violence which erodes the foundations of our political and social organization," he says.

Where does the environment fit into Ocampo's conception of development? "We cannot exploit nature without learning to live with it — as expressed in the concept of sustainable development. These principles have still not been reflected in everyday practices in countries like ours where, at the same time as having the second richest biodiversity on the planet, we have one of the highest rates of deforestation."

Once Ocampo has finished with his public life, he would like to finish a book on industrialization and trade restrictions and write a complete economic history of Colombia.

"Fortunately, there is no end to history because there is liberty and creativity, which become part of the process of development. This is the most beautiful part of humanity, this is the meaning of life — it is to feel oneself as part of a process."

Marcela Giraldo Samper is a journalist in Bogotá.

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